

Maley, Shelley

From: Burke, Julie (HC/SC) <julie.burke@canada.ca> on behalf of Emergency Drug Release /
Distribution de médicament d'urgence (HC/SC) <hc.edr-dmu.sc@canada.ca>
Sent: September-20-18 10:53 AM
To: 12502860042@fax.hc-sc.gc.ca
Cc: [REDACTED] Waddington, Zac
Subject: EDR authorization 2018-29487 & 2018-29488
Attachments: 2018-29487-signed.pdf; 2018-29487_fut.pdf; 2018-29488-signed.pdf; 2018-29488_fut.pdf; 2018-29487_Conditions of release_20SEPT2018.pdf; 2018-29488_Conditions of release_20SEPT2018.pdf

This is to inform you that your Emergency Drug Release (EDR) application has been authorised (see attached) and sent to the manufacturer. Should you require any information regarding the cost and the time frame for the receipt of the drug, please contact the manufacturer directly.

The submission of a follow-up report (see blank form included) is mandatory after the drug is completely used and is a condition for further requests to be authorised.

You may send future EDR requests by fax to 613-946-1125 or as a scan to the email address: hc.edr-dmu.sc@canada.ca

Please note that we strive for a response time of 2 business days for all inquiries and applications received. If your request is urgent or if you have not received a response from us 2 days after submitting an inquiry or application, please follow-up directly by calling the direct phone line for the Emergency Drug Release program at 613-240-3916.

Should you have any questions or concerns, please do not hesitate to contact us.

Thank you,

EDR Program
Veterinary Drugs Directorate
Health Canada

Please note our new phone number: 613-240-3916

Confidentiality Statement: This communication is intended only for the party to whom it is addressed, and may contain information which is privileged or confidential. Any other delivery, distribution, copying or disclosure is strictly prohibited and is not a waiver of privilege or confidentiality. If you have received this electronic communication in error, please notify the sender immediately by return electronic mail and destroy the message. Thank you.

s.19(1)



Health Canada
Santé Canada

**EMERGENCY DRUG RELEASE AUTHORIZATION /
AUTORISATION DE DISTRIBUTION DE MÉDICAMENTS D'URGENCE**

VETERINARY DRUGS DIRECTORATE / DIRECTION DES MÉDICAMENTS VÉTÉRINAIRES

Holland Cross Complex, Tower A, Ground Floor, Address Locator: 3000A

14-11 Holland Avenue, Ottawa, ON K1A 0K9

Tel. / Tél. : 613 240-3916

Fax / Télécopieur : 613 946-1125

hc.edr-dmu.sc@canada.ca

MANUFACTURER - SUPPLIER / FABRICANT - DISTRIBUTEUR Elanco Animal Health, Div. of Eli Lilly Canada Inc. Suite 120 Guelph, ONT, N1G 4T2, CAN	TEL/TÉL :
	FAX/TÉLÉCOPIEUR : Use email
	CONTACT / PERSONNE RESSOURCE

Pursuant to Section C.08.010 of the Food and Drugs Regulations, and notwithstanding Section C.08.002, the above-noted manufacturer is authorized to sell the following drug, in the quantity and under the conditions specified, to the veterinary practitioner named herein. / En vertu de l'article C.08.010 du Règlement sur les aliments et les drogues et nonobstant l'article C.08.002, le fabricant mentionné ci-dessus est autorisé à vendre le médicament suivant dans les quantités et selon les conditions spécifiées au vétérinaire nommé ci-dessous.

DRUG BRAND NAME / NOM COMMERCIAL DU MÉDICAMENT IMVIXA 10%	ACTIVE INGREDIENT(S) / INGRÉDIENT(S) ACTIF(S) lufenuron
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QUANTITY / QUANTITÉ 20 kg

DOSAGE / POSOLOGIE 5 mg/kg/day administered orally in feed for seven days
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VETERINARY PRACTITIONER NAME & ADDRESS / NOM ET ADRESSE DU VÉTÉRIKAIRE Cermaq Canada 203-919 Island Hwy, Campbell River, BC, V9W 2C2	TEL/TÉL : 250-286-0022 FAX/TÉLÉCOPIEUR : 250-286-0042 EMAIL/COURRIEL :
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VETERINARY SITUATION, DISEASE, DIAGNOSIS / JUSTIFICATION DE L'UTILISATION, MALADIE, DIAGNOSTIC In-feed hatchery treatment. Prevention and control of sea lice infestations post marine transfer to Ross Pass and Saranac.

SPECIES / ESPÈCE(S) Atlantic Salmon / Saumon de l'Atlantique
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NUMBER OF ANIMALS, AGE, WEIGHT / NOMBRE D'ANIMAUX, ÂGE, POIDS 2019SW, Avg, wt: 90g, Biomass:
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ANIMAL PATIENT NAME AND OWNER'S NAME or PRODUCTION SITE AND PRODUCER'S NAME / NOM DE L'ANIMAL ET NOM DU PROPRIÉTAIRE ou SITE DE PRODUCTION ET NOM DU PRODUCTEUR Cermaq Canada, Boot Lagoon Hatchery

CONDITIONS It is understood that the efficacy, safety and quality of this new drug have not been evaluated by the Veterinary Drugs Directorate (VDD) and consequently, the veterinary practitioner assumes full responsibility for safety in the intended species and any drug residue related violations in food derived from treated animals. Treated fish must not be slaughtered for use in food for at least 350 days after the latest treatment with this drug. A representative sample of fish from each sea cage must be tested for drug residues and reported to the VDD prior to marketing for human consumption. Fish must not be transferred to sea cages until a minimum of 7 days after the treatment has ended. The VDD and the British Columbia provincial aquaculture authority, Zac Waddington, must be informed if the treated fish are moved to a sea cage site other than Ross Pass or Saranac. Serious adverse drug reactions must be reported to both the VDD and manufacturer within 15 days of suspected occurrence. All unused feed must be destroyed following treatment. Please see the attached letter for complete conditions of release.
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The above-named practitioner has complied with the requirements of Section C.08.010 of the Food and Drugs Regulations to obtain this drug for use according to his / her professional responsibility. In so doing, the practitioner has agreed to report to you and to the Veterinary Drugs Directorate, the results of this emergency use, including efficacy, safety in the intended species and any adverse reactions observed. These results must be submitted before any further authorization can be given. Pursuant to subsection C.08.011 (2) of the said Regulations, this sale is exempt from the provisions of the Food and Drugs Act and Regulations. / Le praticien nommé ci-dessus s'est conformé aux exigences de l'article C.08.010 du Règlement sur les aliments et les drogues afin de se procurer le médicament pour utilisation en accord avec ses responsabilités professionnelles. Ce faisant, le praticien a accepté de rendre compte, au fabricant et à la Direction des médicaments vétérinaires, des résultats de cette utilisation d'urgence, incluant l'efficacité, l'innocuité pour l'espèce visée et toute réaction indésirable observée. Ces résultats doivent être soumis avant que toute autre autorisation ne puisse être délivrée. En vertu du paragraphe C.08.011(2) de la Loi en question, cette vente n'est pas visée par les dispositions de Loi et du Règlement sur les aliments et drogues.

EDR NO. / No DE DMU EDR 2018-29487	NON <input type="checkbox"/> FOOD <input checked="" type="checkbox"/>
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VDD AUTHORITY SIGNATURE / SIGNATAIRE AUTORISÉ DE LA DMV : Dr. Julie Burke, Acting EDR Officer, DVM / Agente intérimaire d'autorisation de médicaments d'urgence	Date : 2018-09-20
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02.11.22

PLEASE NOTE : THIS FACSIMILE IS AN OFFICIAL AUTHORIZATION. IF YOU HAVE PROBLEMS WITH THIS AUTHORIZATION OR TRANSMISSION, PLEASE CONTACT THIS DIRECTORATE.
NOTE : CE FACSIMILÉ CONSTITUE UNE AUTORISATION OFFICIELLE. SI VOUS ÉPROUVEZ DES PROBLÈMES RELATIFS À CETTE AUTORISATION OU CETTE TRANSMISSION, VEUILLEZ CONTACTER LA DIRECTION DES MÉDICAMENTS VÉTÉRINAIRES.



**EMERGENCY DRUG RELEASE FOLLOW UP REPORT /
RAPPORT DE SUIVI D'UNE DISTRIBUTION DE MÉDICAMENTS D'URGENCE**
VETERINARY DRUGS DIRECTORATE / DIRECTION DES MÉDICAMENTS VÉTÉRINAIRES

Holland Cross Complex, Tower A, Ground Floor, Address Locator : 3000A

14-11 Holland Avenue, Ottawa, ON K1A 0K9

Tel. / Tél. : 613 240-3916 Fax / Télécopieur : 613 946-1125

hc.edr-dmu.sc@canada.ca

VETERINARY PRACTITIONER NAME & ADDRESS / NOM ET ADRESSE DU VÉTÉRINAIRE Cermaq Canada 203-919 Island Hwy, Campbell River, BC, V9W 2C2		TEL/TÉL : 250-286-0022 FAX/TÉLÉCOPIEUR : 250-286-0042	
DRUG BRAND NAME / NOM COMMERCIAL DU MÉDICAMENT IMVIXA 10%		SPECIES / ESPOCE Atlantic Salmon	
DOSAGE / POSOLOGIE 5 mg/kg/day administered orally in feed for seven days			
JUSTIFICATION FOR USE / JUSTIFICATION DE L'UTILISATION In-feed hatchery treatment. Prevention and control of sea lice infestations post marine transfer to Ross Pass and Saranac.		Animal Patient Name and Owner's Name or Production Site and Producer's Name / Nom de l'animal et Nom du propriétaire ou Site de production et Nom du Cermaq Canada, Boot Lagoon Hatchery	
QUANTITY AUTHORIZED / QUANTITÉ AUTORISÉE 20 kg	QUANTITY USED / QUANTITÉ UTILISÉE		
EDR NO. / No DE DMU EDR 2018-29487	FILE NO. / No DE DOSSIER DB	DATE : 2018-09-20	
In order for further releases to be authorized : a) this report must be completed and returned to the Veterinary Drugs Directorate, accounting for all quantities of drug received ; and, b) your request for an additional EDR should be in writing (mail or fax) and accompany this report. / Afin de permettre l'autorisation de la distribution subséquente de médicaments il faut: a) que ce rapport soit dûment rempli et retourné à la Direction des médicaments vétérinaires, en rendant compte de toutes les quantités de médicament reçues; et b) que tout demande pour une DMU additionnelle soit faite par écrit (par la poste ou télécopieur) et soit accompagnée de ce rapport.			
If there was some unused drug, how did you dispose of it ? / Si vous n'avez utilisé qu'une portion du médicament, de quelle façon vous l'avez-vous départi du reste?			
RESULTS (efficacy) / RESULTATS (efficacité)			
ADVERSE EVENTS / RÉACTIONS INDÉSIRABLES			
COMMENTS / COMMENTAIRES			
Signature :			Date :

02.11.22 Please use reverse side or a separate sheet to complete your report. / Veuillez utiliser le verso ou une feuille supplémentaire pour compléter votre rapport.



Health Canada / Santé Canada

**EMERGENCY DRUG RELEASE AUTHORIZATION /
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MANUFACTURER - SUPPLIER / FABRICANT - DISTRIBUTEUR Elanco Animal Health, Div. of Eli Lilly Canada Inc. Suite 120 Guelph, ONT, N1G 4T2, CAN	TEL/TÉL :
	FAX/TÉLÉCOPIEUR : Use email
	CONTACT / PERSONNE RESSOURCE

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DRUG BRAND NAME / NOM COMMERCIAL DU MÉDICAMENT IMVIXA 10%	ACTIVE INGREDIENT(S) / INGRÉDIENT(S) ACTIF(S) lufenuron
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QUANTITY / QUANTITÉ 20 kg

DOSAGE / POSOLOGIE 5 mg/kg/day administered orally in feed for seven days
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VETERINARY PRACTITIONER NAME & ADDRESS / NOM ET ADRESSE DU VÉTÉRINAIRE Cermaq Canada 203-919 Island Hwy, Campbell River, BC, V9W 2C2	TEL/TÉL : 250-286-0022 FAX/TÉLÉCOPIEUR : 250-286-0042 EMAIL/COURRIEL :
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VETERINARY SITUATION, DISEASE, DIAGNOSIS / JUSTIFICATION DE L'UTILISATION, MALADIE, DIAGNOSTIC In-feed hatchery treatment. Prevention and control of sea lice infestations post marine transfer to Ross Pass and Saranac.

SPECIES / ESPÈCE(S) Atlantic Salmon / Saumon de l'Atlantique
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NUMBER OF ANIMALS, AGE, WEIGHT / NOMBRE D'ANIMAUX, ÂGE, POIDS 2019SW, Avg. wt: 92g, Biomass:	s.19(1)
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ANIMAL PATIENT NAME AND OWNER'S NAME or PRODUCTION SITE AND PRODUCER'S NAME / NOM DE L'ANIMAL ET NOM DU PROPRIÉTAIRE ou SITE DE PRODUCTION ET NOM DU PRODUCTEUR Cermaq Canada, Oceans farm hatchery	s.20(1)(b)
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CONDITIONS It is understood that the efficacy, safety and quality of this new drug have not been evaluated by the Veterinary Drugs Directorate (VDD) and consequently, the veterinary practitioner assumes full responsibility for safety in the intended species and any drug residue related violations in food derived from treated animals. Treated fish must not be slaughtered for use in food for at least 350 days after the latest treatment with this drug. A representative sample of fish from each sea cage must be tested for drug residues and reported to the VDD prior to marketing for human consumption. Fish must not be transferred to sea cages until a minimum of 7 days after the treatment has ended. The VDD and the British Columbia provincial aquaculture authority, Zac Waddington, must be informed if the treated fish are moved to a sea cage site other than Dixon Bay, Millar Channel or Bawden Point. Serious adverse drug reactions must be reported to both the VDD and manufacturer within 15 days of suspected occurrence. All unused feed must be destroyed following treatment. Please see the attached letter for complete conditions of release.

The above-named practitioner has complied with the requirements of Section C.08.010 of the Food and Drugs Regulations to obtain this drug for use according to his / her professional responsibility. In so doing, the practitioner has agreed to report to you and to the Veterinary Drugs Directorate, the results of this emergency use, including efficacy, safety in the intended species and any adverse reactions observed. These results must be submitted before any further authorization can be given. Pursuant to subsection C.08.011 (2) of the said Regulations, this sale is exempt from the provisions of the Food and Drugs Act and Regulations. / Le praticien nommé ci-dessus s'est conformé aux exigences de l'article C.08.010 du Règlement sur les aliments et les drogues afin de se procurer le médicament pour utilisation en accord avec ses responsabilités professionnelles. Ce faisant, le praticien a accepté de rendre compte, au fabricant et à la Direction des médicaments vétérinaires, des résultats de cette utilisation d'urgence, incluant l'efficacité, l'innocuité pour l'espèce visée et toute réaction indésirable observée. Ces résultats doivent être soumis avant que toute autre autorisation ne puisse être délivrée. En vertu du paragraphe C.08.011(2) de la Loi en question, cette vente n'est pas visée par les dispositions de Loi et du Règlement sur les aliments et drogues.

EDR NO. / No DE DMU EDR 2018-29488	NON <input type="checkbox"/> FOOD <input checked="" type="checkbox"/>
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VDD AUTHORITY SIGNATURE / SIGNATAIRE AUTORISÉ DE LA DMV : Dr. Julie Burke, Acting EDR Officer, DVM / Agente intérimaire d'autorisation de médicaments d'urgence	Date : 2018-09-20
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**EMERGENCY DRUG RELEASE FOLLOW UP REPORT /
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VETERINARY PRACTITIONER NAME & ADDRESS / NOM ET ADRESSE DU VÉTÉRINAIRE Cermaq Canada 203-919 Island Hwy, Campbell River, BC, V9W 2C2		TEL/TÉL : 250-286-0022 FAX/TÉLÉCOPIEUR : 250-286-0042	
DRUG BRAND NAME / NOM COMMERCIAL DU MÉDICAMENT IMVIXA 10%		SPECIES / ESPOCE Atlantic Salmon	
DOSAGE / POSOLOGIE 5 mg/kg/day administered orally in feed for seven days			
JUSTIFICATION FOR USE / JUSTIFICATION DE L'UTILISATION In-feed hatchery treatment. Prevention and control of sea lice infestations post marine transfer to Ross Pass and Saranac.		Animal Patient Name and Owner's Name or Production Site and Producer's Name / Nom de l'animal et Nom du propriétaire ou Site de production et Nom du Cermaq Canada, Oceans farm hatchery	
QUANTITY AUTHORIZED / QUANTITÉ AUTORISÉE 20 kg	QUANTITY USED / QUANTITÉ UTILISÉE		
EDR NO. / No DE DMU EDR 2018-29488	FILE NO. / No DE DOSSIER DB	DATE : 2018-09-20	
In order for further releases to be authorized : a) this report must be completed and returned to the Veterinary Drugs Directorate, accounting for all quantities of drug received ; and, b) your request for an additional EDR should be in writing (mail or fax) and accompany this report. / Afin de permettre l'autorisation de la distribution subséquente de médicaments il faut: a) que ce rapport soit dûment rempli et retourné à la Direction des médicaments vétérinaires, en rendant compte de toutes les quantités de médicament reçues; et b) que tout demande pour une DMU additionnelle soit faite par écrit (par la poste ou télécopieur) et soit accompagnée de ce rapport.			
If there was some unused drug, how did you dispose of it ? / Si vous n'avez utilisé qu'une portion du médicament, de quelle façon vous l'avez-vous départi du reste?			
RESULTS (efficacy) / RESULTATS (efficacité)			
ADVERSE EVENTS / RÉACTIONS INDÉSIRABLES			
COMMENTS / COMMENTAIRES			
Signature :			Date :

02.11.22 Please use reverse side or a separate sheet to complete your report. / Veuillez utiliser le verso ou une feuille supplémentaire pour compléter votre rapport.

EDR CONDITIONS OF RELEASE: EDR 2018-29487

It is understood that the efficacy, safety and quality of this new drug have not been evaluated by the Veterinary Drugs Directorate (VDD) and consequently, the veterinary practitioner assumes full responsibility for safety in the intended species and any drug residue related violations in food derived from treated animals.

Treated fish must not be slaughtered for use in food for at least **350 days** after the latest treatment with this drug.

A representative sample of fish from each sea cage must be tested for drug residues and reported to the VDD prior to marketing for human consumption.

Fish must not be transferred to sea cages until a minimum of 7 days after the treatment has ended.

The VDD and the British Columbia - DFO aquaculture authority, Dr Zac Waddington, must be informed if the treated fish are moved to a sea cage site other than Ross Pass or Saranac.

Serious adverse drug reactions must be reported to both the VDD and manufacturer within 15 days of suspected occurrence.

All unused feed must be destroyed following treatment.

All unused drug must be returned to the manufacturer following treatment.

At the hatchery, do not feed excess diet containing lufenuron.

At the cages housing the treated fish, allow at least 1 year following treatment with lufenuron before restocking to allow natural systems to recover.

Furthermore:

1. This drug product may cause sensitisation by skin contact. Avoid direct contact with skin or eyes.
2. Operators mixing and handling the product should wear protective gloves, glasses and masks. Do not eat, drink or smoke when handling this product and medicated feed. Wash hands thoroughly with soap and water after handling. In case of accidental eye or skin contact, immediately rinse thoroughly with water. In case of accidental ingestion seek medical assistance immediately.
3. The lipophilic nature of lufenuron raises environmental concerns related specifically to the disposal of solid waste (feces and unconsumed feed) that will be produced during the hatchery portion of the production cycle. In order to prevent risk to the environment as a result of the use of Imvixa during the emergency drug release, it is recommended to minimize the release of waste water and solid waste from the Boot Lagoon Hatchery facilities to fish bearing waters and to follow provincial and municipal laws for the disposal of solid waste and waste water. Waste water and solid waste should

be collected, contained, and treated to prevent release to the environment. Solid waste and manure should be disposed of appropriately (e.g. biodigester, incinerator, or solid waste landfill). It is recommended to use a settling pond or lagoon to receive and contain any waste water.

4. Yearly benthic sampling should be collected and sent for drug residue analysis.
5. A follow-up report and answers to the following questions should be submitted to the VDD within 12 months of the Authorization Letter:

1. Hatchery Site name:
2. Number of salmon treated:
3. Average weight of salmon treated:
4. Dates (day/month/year) and total number of days medicated feed was offered:
5. Quantity of IMVIXA used:
6. Quantity of IMVIXA returned to Elanco:
7. Fresh water phase:
 - a. Daily and/or weekly mortality during treatment and post-treatment prior to transfer
 - b. Comparison to industry average
8. Transfer phase:
 - a. Mortality during transfer phase
 - b. Comparison to industry average
9. Salt water phase:
 - a. Name of Marine Site
 - b. Daily and/or weekly mortality Up to and including 4 weeks post transfer
 - c. Comparison to industry average
10. An estimation of the duration of activity, including sea lice counts for the site

Please note, that in June 2015 the Aquaculture Activities Regulations (AAR) of the Fisheries Act came into effect to manage potential impacts of fish pathogen and pest treatments (drugs and pesticides) to fish and fish habitat related to aquaculture activities. Part of this new regulatory regime includes a science-based research and advisory process to examine the feasibility, and need for risk-based post-deposit monitoring and remedial actions for drugs and pesticides including the implementation of environmental monitoring and/or environmental guidelines to address unacceptable risk. As a result, this substance may be subject to further regulatory requirements in the future.

EDR CONDITIONS OF RELEASE: EDR 2018-29488

It is understood that the efficacy, safety and quality of this new drug have not been evaluated by the Veterinary Drugs Directorate (VDD) and consequently, the veterinary practitioner assumes full responsibility for safety in the intended species and any drug residue related violations in food derived from treated animals.

Treated fish must not be slaughtered for use in food for at least **350 days** after the latest treatment with this drug.

A representative sample of fish from each sea cage must be tested for drug residues and reported to the VDD prior to marketing for human consumption.

Fish must not be transferred to sea cages until a minimum of 7 days after the treatment has ended.

The VDD and the British Columbia - DFO aquaculture authority, Dr Zac Waddington, must be informed if the treated fish are moved to a sea cage site other than Ross Pass or Saranac.

Serious adverse drug reactions must be reported to both the VDD and manufacturer within 15 days of suspected occurrence.

All unused feed must be destroyed following treatment.

All unused drug must be returned to the manufacturer following treatment.

At the hatchery, do not feed excess diet containing lufenuron.

At the cages housing the treated fish, allow at least 1 year following treatment with lufenuron before restocking to allow natural systems to recover.

Furthermore:

1. This drug product may cause sensitisation by skin contact. Avoid direct contact with skin or eyes.
2. Operators mixing and handling the product should wear protective gloves, glasses and masks. Do not eat, drink or smoke when handling this product and medicated feed. Wash hands thoroughly with soap and water after handling. In case of accidental eye or skin contact, immediately rinse thoroughly with water. In case of accidental ingestion seek medical assistance immediately.
3. The lipophilic nature of lufenuron raises environmental concerns related specifically to the disposal of solid waste (feces and unconsumed feed) that will be produced during the hatchery portion of the production cycle. In order to prevent risk to the environment as a result of the use of Imvixa during the emergency drug release, it is recommended to minimize the release of waste water and solid waste from the Oceans Hatchery facilities to fish bearing waters and to follow provincial and municipal laws for the disposal of solid waste and waste water. Waste water and solid waste should

be collected, contained, and treated to prevent release to the environment. Solid waste and manure should be disposed of appropriately (e.g. biodigester, incinerator, or solid waste landfill). It is recommended to use a settling pond or lagoon to receive and contain any waste water.

4. Yearly benthic sampling should be collected and sent for drug residue analysis.
5. A follow-up report and answers to the following questions should be submitted to the VDD within 12 months of the Authorization Letter:

1. Hatchery Site name:
2. Number of salmon treated:
3. Average weight of salmon treated:
4. Dates (day/month/year) and total number of days medicated feed was offered:
5. Quantity of IMVIXA used:
6. Quantity of IMVIXA returned to Elanco:
7. Fresh water phase:
 - a. Daily and/or weekly mortality during treatment and post-treatment prior to transfer
 - b. Comparison to industry average
8. Transfer phase:
 - a. Mortality during transfer phase
 - b. Comparison to industry average
9. Salt water phase:
 - a. Name of Marine Site
 - b. Daily and/or weekly mortality Up to and including 4 weeks post transfer
 - c. Comparison to industry average
10. An estimation of the duration of activity, including sea lice counts for the site

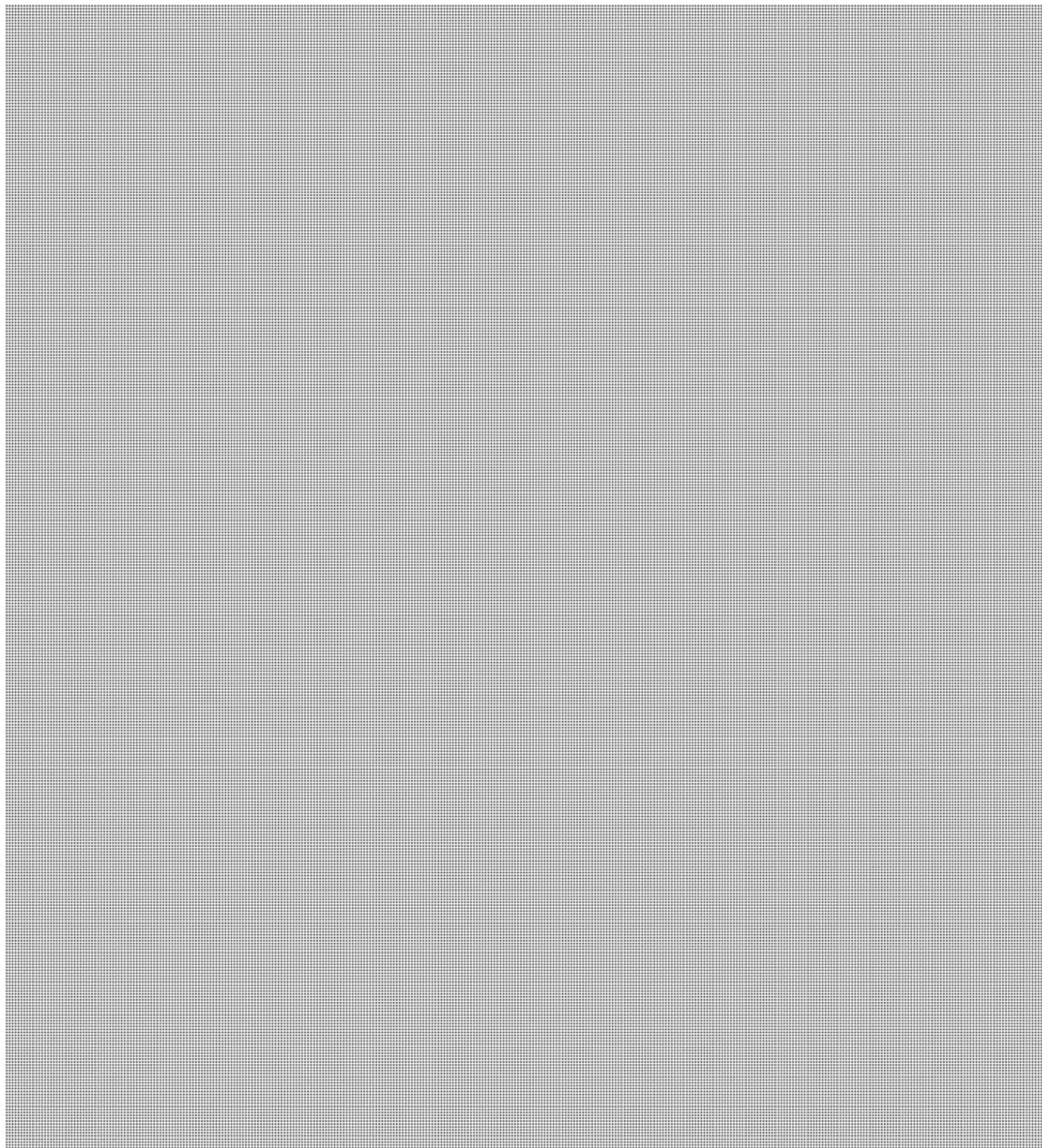
Please note, that in June 2015 the Aquaculture Activities Regulations (AAR) of the Fisheries Act came into effect to manage potential impacts of fish pathogen and pest treatments (drugs and pesticides) to fish and fish habitat related to aquaculture activities. Part of this new regulatory regime includes a science-based research and advisory process to examine the feasibility, and need for risk-based post-deposit monitoring and remedial actions for drugs and pesticides including the implementation of environmental monitoring and/or environmental guidelines to address unacceptable risk. As a result, this substance may be subject to further regulatory requirements in the future.



Ministry of
Environment and Climate Change Strategy

Integrated Pest Management Regulation Review - Aquaculture *Regulatory Proposal*

October 2018



Available at
https://www2.gov.bc.ca/assets/gov/environment/pesticides-and-pest-management/pesticide-use/consultations/aquaculture_regulatory_proposal_2018.pdf

Pages 11 to / à 14
are withheld pursuant to section
sont retenues en vertu de l'article

68(a)

of the Access to Information Act
de la Loi sur l'accès à l'information

Jones, Simon

From: Waddington, Zac
Sent: Friday, November 2, 2018 10:04 AM
To: Jones, Simon; McConnachie, Sarah
Subject: Meeting on the 14th??

Sarah and I are coming down to PBS the morning of the 14th for a meeting. While we are in the area, I'm wondering if we might be able to have a meeting to discuss a few topics that are in your area of expertise:

1. The SLICE resistance model building exercise currently in development with CFIA epidemiologist Raju Gautam
2. Research opportunity to utilize the natural experiment of high lice exposure in Clayoquot 2018 to try and determine what degree, if any, harm resulted from lice.
3. *Paramoeba perurans* surveillance project

Let me know what time might work for you on the 14th.

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)
Lead Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia
Telephone | Téléphone: 250-703-0902
Fax | Télécopieur: 250-703-0921
Zac.Waddington@dfo-mpo.gc.ca

Rainer, Michelle

From: Rainer, Michelle
Sent: Friday, November 2, 2018 10:26 AM
To: Knight, Joe
Subject: Re: Enforcement options

Hi joe,

See below from the 2017 annual report under "enforcement activities". What were those cases about?

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Knight, Joe
Sent: Friday, November 2, 2018 10:23 AM
To: Jensen, Neil; Rainer, Michelle; Walde, Kirsty
Cc: Doucette, Claire
Subject: RE: Enforcement options

I'm sorry but I'm not sure what the two potential violations under consideration are...what is this referring to?

J.

From: Jensen, Neil
Sent: 2018–November-02 9:52 AM
To: Rainer, Michelle; Walde, Kirsty
Cc: Doucette, Claire; Knight, Joe
Subject: RE: Enforcement options

Hi Michelle,

There have been no charges for sea lice, if that is the question. As I understand it, there is currently an investigation into a potential sea lice COL violation. As such, there isn't anything further to comment on at this time. Depending on how the investigation progresses and potential review by Crown Counsel for charge approval, it could be some time before there is something reportable.

Joe or Kirsty – any comments?

Neil Jensen

Fisheries & Oceans Canada / Pêches et Océans Canada
Conservation & Protection / Conservation et Protection

From: Rainer, Michelle
Sent: November-02-18 9:43 AM
To: Jensen, Neil; Walde, Kirsty
Subject: Fw: Enforcement options

Good morning,

Can one of you please help with this, since Claire is away?

Thanks,

Michelle

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Sent: Friday, November 2, 2018 9:12 AM
To: Doucette, Claire
Subject: Fw: Enforcement options

Hi claire,

Were either of the violations that resulted in charges as listed below related to sea lice? If not what were they for?

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: [REDACTED]
Sent: Thursday, November 1, 2018 12:12 PM
To: Rainer, Michelle
Subject: RE: Enforcement options

Hi Michelle,

Thanks for this. Can you confirm whether either of the potential violations under consideration were related to sea lice levels?

From: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Sent: October 31, 2018 2:59 PM
To: [REDACTED]
Subject: Enforcement options

[REDACTED]

I just wanted to follow up on your questions to Zac about enforcement options, which as he explained, fall under the purview of our Conservation and Protection officers and not the Fish Health Audit and Surveillance Program. Below is an overview of the enforcement options available to our C&P officers (from this link):

<http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/mar-rep-rap-2017/compliance-conformite-eng.html#enforcement-options>

The Cermaq sea lice exceedances in Clayoquot are still under review by C&P, so results could entail any of these options but unfortunately I don't know more at this time.

Enforcement options

Fishery Officers are responsible for enforcing the Fisheries Act, the Fishery (General) Regulations, the Pacific Aquaculture Regulations and the Aquaculture Activities Regulations as they pertain to the aquaculture industry in BC and are responsible for investigating potential violations. Reports, complaints and discoveries of potential violations are recorded by Fishery Officers as "occurrences" and must be validated before an enforcement action is taken. The response is determined based on the severity of the violation. There is a range of enforcement options available:

Education

Used to promote compliance and corrective measures.

s.19(1)

Warnings

Issued to the violator and form part of the permanent compliance record for the individual or company. Follow-up inspections and corrective measures may be required.

Charges

An individual or company may face formal charges laid in court for one or more violations. The Fisheries Act allows a maximum penalty of a \$100,000 fine and/or one year in jail for summary convictions and a \$500,000 fine and/or two years in jail for an indictable conviction. Extra costs may also be imposed, and seized items may be forfeited.

Alternative measures

These are measures outside the judicial process. In some cases, the accused will be offered the opportunity to engage in alternative measures or a restorative justice process instead of proceeding to court. Restorative justice is designed to address offending behaviour and conflict in a formally recognized dispute resolution process. Restorative justice may take place before or after charges are laid.

Summary of charges and convictions, 2017

There were no charges or convictions related to marine finfish operations in 2017.


Enforcement activities

In 2017, Aquaculture Fishery Officers conducted 21 site visits and encountered no violations. However, Aquaculture Fishery Officers investigated 2 other potential violations reported to the Department related to marine finfish aquaculture facilities in 2017. One occurrence is under investigation (Fishery General Regulations, section 22(7)) and the other (Fisheries Act, section 36(3)) has been sent to Crown Counsel for prosecution.

Hope this helps and please don't hesitate to contact me if you have any other questions.

Regards,

Michelle



s.16(2)(c)

Rainer, Michelle

From: Rainer, Michelle
Sent: Friday, November 2, 2018 11:03 AM
To: [REDACTED]
Subject: Re: Enforcement options

[REDACTED] Neither for sea lice. One for diesel spill and other was for a sablefish farm but not clear what the violation was there.

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Rainer, Michelle
Sent: Friday, November 2, 2018 9:12 AM
To: [REDACTED]
Subject: Re: Enforcement options

Hi [REDACTED] sorry missed this yesterday (i'm taking a course) but checking for you.
Michelle

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: [REDACTED]
Sent: Thursday, November 1, 2018 12:12 PM
To: Rainer, Michelle
Subject: RE: Enforcement options

Hi Michelle,

Thanks for this. Can you confirm whether either of the potential violations under consideration were related to sea lice levels?

From: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Sent: October 31, 2018 2:59 PM
To: [REDACTED]
Subject: Enforcement options

[REDACTED]

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These are measures outside the judicial process. In some cases, the accused will be offered the opportunity to engage in alternative measures or a restorative justice process instead of proceeding to court. Restorative justice is designed to address offending behaviour and conflict in a formally recognized dispute resolution process. Restorative justice may take place before or after charges are laid.

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In 2017, Aquaculture Fishery Officers conducted 21 site visits and encountered no violations. However, Aquaculture Fishery Officers investigated 2 other potential violations reported to the Department related to marine finfish aquaculture facilities in 2017. One occurrence is under investigation (Fishery General Regulations, section 22(7)) and the other (Fisheries Act, section 36(3)) has been sent to Crown Counsel for prosecution.

Hope this helps and please don't hesitate to contact me if you have any other questions.

Regards,

Michelle



s.16(2)(c)

Maley, Shelley

From: Mack Bartlett
Sent: November-03-18 9:46 PM
To: Waddington, Zac
Subject: Re: Contact info

No worries!

I am sure its a busy time. Saw the Toronto star article last week.

Cheers,

Mack

On Fri, Nov 2, 2018 at 10:18 AM Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca> wrote:

Thanks very much for reaching out again and putting us in touch. I'll follow up with Andrew, sorry again I've taken so long to respond, my emails tend to get buried in a barrage of other ones.

Zac

From: Mack Bartlett
Sent: October-17-18 5:17 PM
To: Andrew Bateman
Cc: Waddington, Zac
Subject: Re: Contact info

Hi Zac,

I am connecting you with a colleague Andrew Bateman. He has been interested in slice resistance along with the influence of wild-type lice and other factors that may have altered the emergence of resistance in BC. I thought it may be good for you two to chat.

Hope all is well,

s.19(1)

Mack

On Fri, Sep 21, 2018 at 12:43 PM Mack Bartlett <[REDACTED]> wrote:

Hey Zac and Nathan,

Thanks for getting back to me. The best I can gather is that the province/DFO took part in the BAMP program in the Broughton Archipelago in the 2000's. The Nuuchahnulth TC fisheries and the Wild fish conservancy did juvenile salmon and sealice monitoring in 2004-2007 and 2009-2010 respectively and that more recently Cermaq has been contracting Ahousaht fisheries to conduct wild smolt sampling. Interesting that DFO aquaculture was doing sampling in Esperanza I would be curious to hear how that went. Is there any information available on that program?

All the best,

Mack

On Thu, Sep 20, 2018 at 4:44 PM Blasco, Nathan <Nathan.Blasco@dfo-mpo.gc.ca> wrote:

Mac and Zac,

DFO aquaculture management staff only started looking at Sealice on wild smolts a couple of years ago and it was not in Clayoquot Sound, only Esperanza Inlet in Nootka Sound. That is not to say it won't happen there in the future we will see. As for other DFO groups, I have no idea if there was anyone else doing that work, sorry. Howie may have done sealice/wild smolt work when he was with the province. In fact I am pretty sure he did but it may have only been in the Broughton, you'd have to ask him.

Nathan

Sent from my BlackBerry 10 smartphone on the Bell network.

From: Waddington, Zac

Sent: Thursday, September 20, 2018 3:29 PM

To: 'Mack Bartlett'

Cc: Blasco, Nathan

Subject: RE: Contact info

Hey sorry for my super delayed response! Your email got buried in a sea of others, and I forgot to get back to you until I stumbled upon it today. To answer your questions: I know DFO has conducted smolt sampling in Clayoquot in the past, but that was well before my time with DFO and I'm not sure of the outcome of that. If there was data from that I would have no issue sharing that since it's not part of the ongoing investigation taking place currently. I have cc'ed Nathan Blasco who is a biologist who has worked doing the beach seining in the past, he might be able to offer some insight???

Hope that helps, sorry I couldn't share more, as soon as I get the ok I'd be happy to provide you more details,

Zac

From: Mack Bartlett
Sent: August-30-18 10:31 AM
To: Waddington, Zac
Subject: Re: Contact info

Hey Zac,

Also just wondering, is there assay data available from past events in BC that would be available? Also did DFO ever conduct any wild juvenile salmon/ sealice assessments in Clayoquot Sound, if so is there data available from that? I was aware of assessments done in 2004-2007 and 2009-2010 by other parties but unsure if dfo ever did sampling or has available data.

Cheers,

s.19(1)

Mack

On Thu, Aug 30, 2018 at 9:40 AM Mack Bartlett <[REDACTED]> wrote:

Hey Zac,

Not a problem. Thanks for letting me know.

Cheers,

Mack

On Thu, Aug 30, 2018 at 9:11 AM Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca> wrote:

I would be happy to share it with you; however my manager and director have concerns about how/if it might compromise the investigation being conducted by Conservation and Protection branch into the sea lice over thresholds in Clayoquot this last spring. So I'll have to wait to hear back what they say we can distribute. Sorry about that,

Zac

From: Mack Bartlett [REDACTED]
Sent: August-29-18 2:45 PM
To: Waddington, Zac
Subject: Re: Contact info

Hey Zac,

I was wondering if I could actually see some of the assay data that is available.

Cheers,

s.19(1)

Mack

On Wed, Aug 29, 2018 at 11:27 AM Mack Bartlett <[REDACTED]> wrote:

Hi Zac,

Thanks for calling yesterday, I really appreciate you reaching out and answering some questions.

Cheers,

Mack

On Tue, Aug 28, 2018 at 5:06 PM Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca> wrote:

Thanks very much for your ongoing work and interest in the ecology of Clayoquot. I am happy to try and answer whatever questions I can in the future.

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)
Lead Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia
Telephone | Téléphone: 250-703-0902
Fax | Télécopieur: 250-703-0921
Zac.Waddington@dfo-mpo.gc.ca

Mack Bartlett

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Research Coordinator

Cedar Coast Field Station

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Mack Bartlett

Research Coordinator

Cedar Coast Field Station

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Research Coordinator
Cedar Coast Field Station



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Research Coordinator
Cedar Coast Field Station

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Mack Bartlett
Research Coordinator
Cedar Coast Field Station



Maley, Shelley

From: Waddington, Zac
Sent: November-05-18 9:01 AM
To: McConnachie, Sarah
Subject: FW: refined SLICE use table
Attachments: Resistance Assessment - Krista.xlsx

Take a peek at the link below, that's where Krista stored a pile of the data that we pulled together for Raju.

Zac

From: Sandberg, Krista
Sent: July-04-18 1:03 PM
To: Waddington, Zac; 'Gautam, Raju (CFIA/ACIA)'
Subject: RE: refined SLICE use table

I've added Ian's comments, though there are few.

I used the count 2 reporting months post treatment in all cases that I could. This was almost always lower than one month post treatment but often slightly higher than 3 months post treatment. Keep in mind that this is using reporting month, so the actual treatment could have occurred at the beginning or end of the month and the post treatment counts could have occurred at the beginning or end of the month, so we basically have a 2 month window in where the actual dates lie.

As for residual, when I have time, it would be interesting to add in the 4 month post-treatment count, where it exists as an indicator of residual. I suspect we may see a trend there as well. I think the overabundance notifications are pretty patchy, so don't know if they would be reliable.

Krista.

\\Dcbcvanna01b\\VAN_RHQ_4\\Aqua\\AEO\\Courtenay\\FH\\sea lice management\\Resistance Assessment - Krista.xlsx

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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From: Waddington, Zac
Sent: July-04-18 12:49 PM
To: Sandberg, Krista; 'Gautam, Raju (CFIA/ACIA)'
Subject: RE: refined SLICE use table

Excellent. So just to summarize so I understand: the pre-treatment count was the highest count in the month of (or preceding) the treatment, and the post-treatment count used was the lowest in the 2 months following treatment?? I am reading the Lees et al., 2008 paper currently, and they found that within 30 days most often lice levels fell below the 60% reduction, though occasionally it took up to 60 days. So if we use 2 months that should be sufficient.

It would be excellent if we could build in some measure of residual effect, but I suspect season would have a huge impact on that. Ideally, if the residual effect isn't long enough, we should expect to see another treatment occurring in a

shorter time frame, and that would be captured in our existing dataset. I wonder if we could use sea lice over threshold notification data post-treatment to determine a rough proxy for residual effect?? What do you think??

Zac

From: Sandberg, Krista
Sent: July-04-18 12:42 PM
To: Waddington, Zac; 'Gautam, Raju (CFIA/ACIA)'
Subject: RE: refined SLICE use table

Oh yes, I meant to mention that in my email. I used a general rule of 2 reporting months post-treatment. It's important to keep in mind that this is a snapshot general analysis. It's not based on concrete treatment dates, just a ballpark of the highest reported abundance pre-treatment month (could be that month or the month before), and then 2 reporting months after that for the post treatment count. I made notes when there were deviations. I noticed that quite often when there were suspected resistance issues, the first sign was that there was no residual, so even if a reasonable decrease in abundance occurred after treatment, the abundance went back up again very quickly, and often resulted in a second treatment with lesser effect.

I also realized that I didn't add in Ian's comments like I said I would. Doing that now...

Krista.

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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From: Waddington, Zac
Sent: July-04-18 12:30 PM
To: Sandberg, Krista; 'Gautam, Raju (CFIA/ACIA)'
Subject: RE: refined SLICE use table

Wow! Thanks very much Krista. What time frame did you put on the post-treatment counts? The Lees et al., 2008 paper defined it as <40% lice motile lice remaining at any point up to 13 weeks post treatment. Was that the same rule you applied?

Zac

From: Sandberg, Krista
Sent: July-04-18 11:53 AM
To: 'Gautam, Raju (CFIA/ACIA)'; Waddington, Zac
Subject: RE: refined SLICE use table

Please see attached. I hope this makes sense. Let me know if you have any questions ☺

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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From: Gautam, Raju (CFIA/ACIA) [mailto:raju.gautam@canada.ca]
Sent: July-04-18 10:31 AM
To: Sandberg, Krista; Waddington, Zac
Subject: RE: refined SLICE use table

And if possible, please add facility reference number, which is currently missing from the data in which you identified rows to be removed.
Raju

From: Sandberg, Krista [mailto:Krista.Sandberg@dfo-mpo.gc.ca]
Sent: 2018-07-04 1:29 PM
To: Gautam, Raju (CFIA/ACIA); Waddington, Zac
Subject: RE: refined SLICE use table

Hold tight. I'm just finishing up my additions of pre/post treatment lice abundances, along with refinements to the treatments that can be removed. I should have this to you by lunch.

Krista.

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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From: Gautam, Raju (CFIA/ACIA) [mailto:raju.gautam@canada.ca]
Sent: July-04-18 10:22 AM
To: Sandberg, Krista; Waddington, Zac
Subject: RE: refined SLICE use table

Hi Sheri,
I can make use of this if you think it is complete now. Are the once to be removed in red font? What about the once highlighted in yellow?

Raju

From: Sandberg, Krista [mailto:Krista.Sandberg@dfo-mpo.gc.ca]
Sent: 2018-07-03 3:03 PM
To: Waddington, Zac
Cc: Gautam, Raju (CFIA/ACIA)
Subject: RE: refined SLICE use table

I've had a look at Ian's file and identified a few more that I think need to be removed – Raju, I can redo the file that I sent you earlier if that's easier.

Krista.

Krista Sandberg
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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Canada

From: Waddington, Zac
Sent: July-03-18 10:15 AM
To: Sandberg, Krista
Subject: FW: refined SLICE use table

Here's the SLICE use table that Ian generated over the weekend wherein he removed duplicate entries that went over months, and brood sites. I'm guessing that this should line up nicely with your submitted data to Raju?

Zac

From: Keith, Ian
Sent: June-29-18 9:26 PM
To: Gautam, Raju (CFIA/ACIA) (raju.gautam@canada.ca)
Cc: Waddington, Zac
Subject: FW: refined SLICE use table

Hi Raju,
Attached the worksheet 'NO BROOD NO DUPLICATES' from this spreadsheet.
280 cases 2013-2018. The extra 17 that were in Zac's file were broodsites and duplicates.
You're good to go.
Ian

From: Keith, Ian
Sent: June-29-18 7:39 PM
To: 'raju.gautam@canada.ca'
Cc: Waddington, Zac
Subject: FW: refined SLICE use table

It was filter function so I will compare the datasets and get back to you.
Ian

From: Keith, Ian
Sent: June-29-18 6:45 PM
To: 'Gautam, Raju (CFIA/ACIA)'
Cc: Waddington, Zac
Subject: RE: refined SLICE use table

Hi Raju,
Sorry for not reading emails earlier.
I started with the dataset that was sent by Krista on Monday, Antibiotic and Production Summary_ALL COMPANIES_restored.xls..but it is 867kb and 1731 rows and the dataset that was saved today with the same file name, at 4:05, in the same folder is 870kb and 1555 rows.
I worked only with the worksheet 'DATA' and have only the Emamectin treatment data. I removed observations where the treatment is recorded for successive months, March and April for example, and recorded it as just April because the treatment started in March and finished in April i.e. the same treatment but with quarterly reports, and no specific instructions for which quarterly report to capture the treatment in. (I expected two records for the same treatment.) This accounts for only a few duplicate treatments however.
I also removed ALL BROOD FACILITIES because you were using just Atlantic salmon production facilities.
Otherwise I added treatments for April 2011 to December 2012Q4. I added these to Antibiotic and Production Summary_ALL COMPANIES_restored.xls/DATA which began with January 2013 and ended with March 2018.
I had access to January 2011-March 2011 but you said that you were using data beginning with April 2011 so I didn't include them.

I see how Zac has all months in this 1555 row spreadsheet but there must be some protection – I can't see more than the last farm, Wicklow so can't see if he removed BROOD facilities and the double records for the same treatment. I hope from this information you can explain the discrepancy but if you are able to send me the spreadsheet Zac sent you, with protection removed so that I can scroll and compare I may be able to assist you tonight.

Ian

From: Gautam, Raju (CFIA/ACIA) [mailto:raju.gautam@canada.ca]
Sent: June-29-18 3:15 PM
To: Keith, Ian
Cc: Waddington, Zac
Subject: RE: refined SLICE use table

Hi Ian,

Sorry, I was working on the existing data and didn't have time to read through your email and attached files. As I see in the attached excel sheet, there are 298 observations (treatment events), I have a question: Are these all the observations? From what I compiled from the two datasets, one consisting of data from 2013-2018 that Zac provided and the other from 2011-2012 that you provided, there are 315 observation (treatment events). If I use the latest file you sent, then we are short of 17 treatment events. Just wanted to clarify, which dataset should I rely on?

Thank you.
Raju

From: Keith, Ian [mailto:Ian.Keith@dfo-mpo.gc.ca]
Sent: 2018-06-28 9:39 PM
To: Gautam, Raju (CFIA/ACIA)
Cc: Waddington, Zac
Subject: refined SLICE use table

Hi Raju,

Please find attached a refined SLICE use table, renamed from what I sent Tuesday night.

You will find in Column 'P,' highlighted in yellow, what I have classified as resistant or treatment failure. Zac and I discussed again yesterday that we don't have a definition for resistant or treatment failure and my solution was to classify them and provide the data supporting the classifying the case.

I have also highlighted in blue, evidence of reduced efficacy: Messmer et al. give 79% efficacy for a farm compared with all zone (excepting 3.5) efficacy, 90% in 2012. In a different presentation there is the ranking of areas where EC50 for Quatsino is 120 ppb in 2011, higher than EC50 for the other zones (except 3.5)

I have also highlighted in green, cases where I suspect some reduced efficacy but no bioassay data or strong evidence of selecting resistant lice.

I have comments too, without highlight, where there is repeated treatment without recruitment of lice from wild fish. These are farms that we think have increased risk of resistance. Along with these comments are farms where there is evidence of internal recruitment i.e. 'INTERNAL AMPLIFICATION.' This is expected and I haven't done an exhaustive job of capturing these in Column 'P', only those for which I have some suspicion of increased risk of resistance selection. So I leave these for you, imagining that you might, using a categorical variable, capture only the yellow highlighted cases. However, the weaker data are there too, the blue and green highlighted and the unhighlighted cases for creating a ordinal variable if the data can tolerate this. My order is yellow, blue, green and unhighlighted.

Good luck

Ian

Dr. Ian Keith DVM
Field Operations Veterinarian – Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Fisheries Management
Aquaculture Management Division | Gestion de l'aquaculture

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No further information has been removed or severed from this page

Company	SiteREF	FacilityName	LandfileNo	Fish Health Zone
irine Harvest Canada I	1338	2km NE of Mahatta River, Quatsino Sound	1403748	2.4
irine Harvest Canada I	1338	2km NE of Mahatta River, Quatsino Sound	1403748	2.4
irine Harvest Canada I	1338	2km NE of Mahatta River, Quatsino Sound	1403748	2.4
irine Harvest Canada I	1338	2km NE of Mahatta River, Quatsino Sound	1403748	2.4
Grieg Seafood BC Ltd.	1698	Ahlstrom Point, Jervis Inlet	2408042	3.1
Grieg Seafood BC Ltd.	1698	Ahlstrom Point, Jervis Inlet	2408042	3.1
Grieg Seafood BC Ltd.	1698	Ahlstrom Point, Jervis Inlet	2408042	3.1
Grieg Seafood BC Ltd.	1698	Ahlstrom Point, Jervis Inlet	2408042	3.1
Grieg Seafood BC Ltd.	1698	Ahlstrom Point, Jervis Inlet	2408042	3.1
Grieg Seafood BC Ltd.	1698	Ahlstrom Point, Jervis Inlet	2408042	3.1
irine Harvest Canada I	1300	Althorpe, Sunderland Channel	1407426	3.3
irine Harvest Canada I	1300	Althorpe, Sunderland Channel	1407426	3.3
irine Harvest Canada I	1300	Althorpe, Sunderland Channel	1407426	3.3
irine Harvest Canada I	1300	Althorpe, Sunderland Channel	1407426	3.3
irine Harvest Canada I	1300	Althorpe, Sunderland Channel	1407426	3.3
irine Harvest Canada I	1300	Althorpe, Sunderland Channel	1407426	3.3
irine Harvest Canada I	1300	Althorpe, Sunderland Channel	1407426	3.3
Grieg Seafood BC Ltd.	1738	Atrevida Point, Hanna Channel	1411084	2.4
Grieg Seafood BC Ltd.	1738	Atrevida Point, Hanna Channel	1411084	2.4
Cermaq Canada Ltd	1537	Bare Bluff, Clayoquot Snd, Bedwell Snd	1403979	2.3
Cermaq Canada Ltd	1537	Bare Bluff, Clayoquot Snd, Bedwell Snd	1403979	2.3
Cermaq Canada Ltd	1537	Bare Bluff, Clayoquot Snd, Bedwell Snd	1403979	2.3
Grieg Seafood BC Ltd.	871	Barnes Bay, Sonora Island	1405542	3.2
Grieg Seafood BC Ltd.	871	Barnes Bay, Sonora Island	1405542	3.2
Grieg Seafood BC Ltd.	871	Barnes Bay, Sonora Island	1405542	3.2
Grieg Seafood BC Ltd.	871	Barnes Bay, Sonora Island	1405542	3.2
Grieg Seafood BC Ltd.	871	Barnes Bay, Sonora Island	1405542	3.2
Grieg Seafood BC Ltd.	871	Barnes Bay, Sonora Island	1405542	3.2
Grieg Seafood BC Ltd.	871	Barnes Bay, Sonora Island	1405542	3.2
Cermaq Canada Ltd	227	Bawden Point, Herbert Inlet	1403647	2.3
Cermaq Canada Ltd	227	Bawden Point, Herbert Inlet	1403647	2.3
Cermaq Canada Ltd	227	Bawden Point, Herbert Inlet	1403647	2.3
Cermaq Canada Ltd	227	Bawden Point, Herbert Inlet	1403647	2.3
Cermaq Canada Ltd	227	Bawden Point, Herbert Inlet	1403647	2.3
Cermaq Canada Ltd	227	Bawden Point, Herbert Inlet	1403647	2.3
Cermaq Canada Ltd	520	Bedwell, East Shore	1403980	2.3
Cermaq Canada Ltd	520	Bedwell, East Shore	1403980	2.3
Cermaq Canada Ltd	520	Bedwell, East Shore	1403980	2.3
Grieg Seafood BC Ltd.	1825	Bennett Point, Clio Channel	1411154	3.3
Grieg Seafood BC Ltd.	1825	Bennett Point, Clio Channel	1411154	3.3

Grieg Seafood BC Ltd.	1825	Bennett Point, Clio Channel	1411154	3.3
Cermaq Canada Ltd	1148	Binns Island, Herbert Inlet	1406648	2.3
Cermaq Canada Ltd	1148	Binns Island, Herbert Inlet	1406648	2.3
Cermaq Canada Ltd	1148	Binns Island, Herbert Inlet	1406648	2.3
Cermaq Canada Ltd	1401	Brent Island, Okisollo Channel	1407983	3.2
Cermaq Canada Ltd	1401	Brent Island, Okisollo Channel	1407983	3.2
Cermaq Canada Ltd	1401	Brent Island, Okisollo Channel	1407983	3.2
Cermaq Canada Ltd	1401	Brent Island, Okisollo Channel	1407983	3.2
Cermaq Canada Ltd	1401	Brent Island, Okisollo Channel	1407983	3.2
Cermaq Canada Ltd	1401	Brent Island, Okisollo Channel	1407983	3.2
Cermaq Canada Ltd	1401	Brent Island, Okisollo Channel	1407983	3.2
Cermaq Canada Ltd	1401	Brent Island, Okisollo Channel	1407983	3.2
Cermaq Canada Ltd	1401	Brent Island, Okisollo Channel	1407983	3.2
Cermaq Canada Ltd	1144	Burdwood Group, Raleigh Passage	1406650	3.3
Cermaq Canada Ltd	1144	Burdwood Group, Raleigh Passage	1406650	3.3
Cermaq Canada Ltd	1144	Burdwood Group, Raleigh Passage	1406650	3.3
Cermaq Canada Ltd	1144	Burdwood Group, Raleigh Passage	1406650	3.3
Cermaq Canada Ltd	819	Cecil Island, Greenway Sound	1405181	3.3
Cermaq Canada Ltd	819	Cecil Island, Greenway Sound	1405181	3.3
irine Harvest Canada I	790	Chancellor Channel, West Thurlow Island	1405245	3.2
irine Harvest Canada I	790	Chancellor Channel, West Thurlow Island	1405245	3.2
Grieg Seafood BC Ltd.	1789	Concepcion Pt., Bligh Island	1405634	2.4
Grieg Seafood BC Ltd.	1789	Concepcion Pt., Bligh Island	1405634	2.4
Grieg Seafood BC Ltd.	1789	Concepcion Pt., Bligh Island	1405634	2.4
Grieg Seafood BC Ltd.	1789	Concepcion Pt., Bligh Island	1405634	2.4
Grieg Seafood BC Ltd.	1789	Concepcion Pt., Bligh Island	1405634	2.4
Grieg Seafood BC Ltd.	1697	Culloden Point, Jervis Inlet	2408043	3.1
Grieg Seafood BC Ltd.	1697	Culloden Point, Jervis Inlet	2408043	3.1
Grieg Seafood BC Ltd.	1697	Culloden Point, Jervis Inlet	2408043	3.1
Grieg Seafood BC Ltd.	1697	Culloden Point, Jervis Inlet	2408043	3.1
Cermaq Canada Ltd	458	Cypress Hrbr, Harbour Pt, Suttle Channel	1405381	3.3
Cermaq Canada Ltd	458	Cypress Hrbr, Harbour Pt, Suttle Channel	1405381	3.3
irine Harvest Canada I	733	Cyrus Rocks	1406292	3.2
irine Harvest Canada I	733	Cyrus Rocks	1406292	3.2
irine Harvest Canada I	733	Cyrus Rocks	1406292	3.2
Cermaq Canada Ltd	234	Dixon Point, Shelter Inlet	1403293	2.3
Cermaq Canada Ltd	234	Dixon Point, Shelter Inlet	1403293	2.3
Cermaq Canada Ltd	234	Dixon Point, Shelter Inlet	1403293	2.3
Cermaq Canada Ltd	234	Dixon Point, Shelter Inlet	1403293	2.3
Cermaq Canada Ltd	234	Dixon Point, Shelter Inlet	1403293	2.3
irine Harvest Canada I	1586	Doctor Islets, Knight Inlet	1408758	3.3
irine Harvest Canada I	1586	Doctor Islets, Knight Inlet	1408758	3.3
irine Harvest Canada I	1586	Doctor Islets, Knight Inlet	1408758	3.3
irine Harvest Canada I	1586	Doctor Islets, Knight Inlet	1408758	3.3
irine Harvest Canada I	1288	Doyle Island, Gordon Group	1407325	3.4
irine Harvest Canada I	1288	Doyle Island, Gordon Group	1407325	3.4
irine Harvest Canada I	1288	Doyle Island, Gordon Group	1407325	3.4

arine Harvest Canada I	1288	Doyle Island, Gordon Group	1407325	3.4
arine Harvest Canada I	1288	Doyle Island, Gordon Group	1407325	3.4
arine Harvest Canada I	1293	Duncan Island, Goletas Channel	1407326	3.4
arine Harvest Canada I	1293	Duncan Island, Goletas Channel	1407326	3.4
arine Harvest Canada I	1293	Duncan Island, Goletas Channel	1407326	3.4
arine Harvest Canada I	1293	Duncan Island, Goletas Channel	1407326	3.4
Grieg Seafood BC Ltd.	1863	Esperanza, Hecate Channel	1411181	2.4
Grieg Seafood BC Ltd.	1863	Esperanza, Hecate Channel	1411181	2.4
Grieg Seafood BC Ltd.	1863	Esperanza, Hecate Channel	1411181	2.4
Cermaq Canada Ltd	540	Fortune Channel, East side Warn Bay	1403914	2.3
Cermaq Canada Ltd	540	Fortune Channel, East side Warn Bay	1403914	2.3
arine Harvest Canada I	7053	Ghi ya, Bull Harbour, Hope Isl	1414224	3.4
arine Harvest Canada I	7053	Ghi ya, Bull Harbour, Hope Isl	1414224	3.4
arine Harvest Canada I	303	Glacial Creek, near Jervis Inlet	2402751	3.1
arine Harvest Canada I	303	Glacial Creek, near Jervis Inlet	2402751	3.1
arine Harvest Canada I	821	Glacial Falls, Watson Cove, Tribune Channel	1405180	3.3
arine Harvest Canada I	821	Glacial Falls, Watson Cove, Tribune Channel	1405180	3.3
arine Harvest Canada I	821	Glacial Falls, Watson Cove, Tribune Channel	1405180	3.3
arine Harvest Canada I	821	Glacial Falls, Watson Cove, Tribune Channel	1405180	3.3
arine Harvest Canada I	821	Glacial Falls, Watson Cove, Tribune Channel	1405180	3.3
arine Harvest Canada I	821	Glacial Falls, Watson Cove, Tribune Channel	1405180	3.3
arine Harvest Canada I	1702	Goat Cove, Roderick Island	6407324	3.5
arine Harvest Canada I	1702	Goat Cove, Roderick Island	6407324	3.5
arine Harvest Canada I	1702	Goat Cove, Roderick Island	6407324	3.5
arine Harvest Canada I	1702	Goat Cove, Roderick Island	6407324	3.5
arine Harvest Canada I	1702	Goat Cove, Roderick Island	6407324	3.5
arine Harvest Canada I	1702	Goat Cove, Roderick Island	6407324	3.5
arine Harvest Canada I	892	Goletas Channel, S.E. Bell Island	1404918	3.4
arine Harvest Canada I	892	Goletas Channel, S.E. Bell Island	1404918	3.4
arine Harvest Canada I	892	Goletas Channel, S.E. Bell Island	1404918	3.4
Grieg Seafood BC Ltd.	1762	Gore Island, King Passage	1411100	2.4
arine Harvest Canada I	1581	Hardwicke Is. Site B, Chancellor Channel	1409321	3.2
arine Harvest Canada I	1581	Hardwicke Is. Site B, Chancellor Channel	1409321	3.2
arine Harvest Canada I	1581	Hardwicke Is. Site B, Chancellor Channel	1409321	3.2
arine Harvest Canada I	1581	Hardwicke Is. Site B, Chancellor Channel	1409321	3.2
arine Harvest Canada I	1581	Hardwicke Is. Site B, Chancellor Channel	1409321	3.2
arine Harvest Canada I	1581	Hardwicke Is. Site B, Chancellor Channel	1409321	3.2
arine Harvest Canada I	1581	Hardwicke Is. Site B, Chancellor Channel	1409321	3.3
arine Harvest Canada I	1618	Humphrey Rock, Tribune Channel	1409707	3.3
arine Harvest Canada I	1618	Humphrey Rock, Tribune Channel	1409707	3.3
arine Harvest Canada I	1618	Humphrey Rock, Tribune Channel	1409707	3.3
arine Harvest Canada I	1618	Humphrey Rock, Tribune Channel	1409707	3.3

arine Harvest Canada I	1618	Humphrey Rock, Tribune Channel	1409707	3.3
arine Harvest Canada I	1580	Jackson Passage S.of Finlayson Channel	6406814	3.5
arine Harvest Canada I	1691	Kid Bay, Roderick Island	6406984	3.5
arine Harvest Canada I	1691	Kid Bay, Roderick Island	6406984	3.5
arine Harvest Canada I	1691	Kid Bay, Roderick Island	6406984	3.5
arine Harvest Canada I	1691	Kid Bay, Roderick Island	6406984	3.5
arine Harvest Canada I	1691	Kid Bay, Roderick Island	6406984	3.5
arine Harvest Canada I	1691	Kid Bay, Roderick Island	6406984	3.5
arine Harvest Canada I	1691	Kid Bay, Roderick Island	6406984	3.5
arine Harvest Canada I	144	Koskimo Bay, Quatsino Sound	1401723	2.4
arine Harvest Canada I	144	Koskimo Bay, Quatsino Sound	1401723	2.4
arine Harvest Canada I	144	Koskimo Bay, Quatsino Sound	1401723	2.4
arine Harvest Canada I	144	Koskimo Bay, Quatsino Sound	1401722	2.4
arine Harvest Canada I	144	Koskimo Bay, Quatsino Sound	1401722	2.4
arine Harvest Canada I	144	Koskimo Bay, Quatsino Sound	1401722	2.4
arine Harvest Canada I	144	Koskimo Bay, Quatsino Sound	1401722	2.4
arine Harvest Canada I	144	Koskimo Bay, Quatsino Sound	1401722	2.4
arine Harvest Canada I	100	Lees Bay, N. Shore, West Thurlow Is.	1401949	3.2
arine Harvest Canada I	100	Lees Bay, N. Shore, West Thurlow Is.	1401949	3.2
arine Harvest Canada I	100	Lees Bay, N. Shore, West Thurlow Is.	1401949	3.2
arine Harvest Canada I	100	Lees Bay, N. Shore, West Thurlow Is.	1401949	3.2
arine Harvest Canada I	1896	Lime Bay, vicinity of Pooley Island	6407840	3.5
arine Harvest Canada I	1896	Lime Bay, vicinity of Pooley Island	6407840	3.5
arine Harvest Canada I	884	Lochalsh Bay, Jackson Passage	6403484	3.5
arine Harvest Canada I	884	Lochalsh Bay, Jackson Passage	6403484	3.5
arine Harvest Canada I	1338	Mahatta East, Quatsino Sound	1403748	2.4
arine Harvest Canada I	1238	Mahatta West, Koskimo Islands, Quatsino Sound	1406961	2.4
arine Harvest Canada I	1238	Mahatta West, Koskimo Islands, Quatsino Sound	1406961	2.4
arine Harvest Canada I	1238	Mahatta West, Koskimo Islands, Quatsino Sound	1406961	2.4
arine Harvest Canada I	1238	Mahatta West, Koskimo Islands, Quatsino Sound	1406961	2.4
arine Harvest Canada I	1351	Marsh Bay, Stuart Rock N. of P. Hardy	1407749	3.4
arine Harvest Canada I	1351	Marsh Bay, Stuart Rock N. of P. Hardy	1407749	3.4
arine Harvest Canada I	1351	Marsh Bay, Stuart Rock N. of P. Hardy	1407749	3.4
arine Harvest Canada I	1351	Marsh Bay, Stuart Rock N. of P. Hardy	1407749	3.4
Cermaq Canada Ltd	869	Maude Island, SE Broughton Is.,	1405739	3.3
Cermaq Canada Ltd	869	Maude Island, SE Broughton Is.,	1405739	3.3
arine Harvest Canada I	467	Midsummer Island, Spring Passage	1404380	3.3
arine Harvest Canada I	467	Midsummer Island, Spring Passage	1404380	3.3
arine Harvest Canada I	467	Midsummer Island, Spring Passage	1404380	3.3
arine Harvest Canada I	467	Midsummer Island, Spring Passage	1404380	3.3
arine Harvest Canada I	467	Midsummer Island, Spring Passage	1404380	3.3
arine Harvest Canada I	467	Midsummer Island, Spring Passage	1404380	3.3
Cermaq Canada Ltd	1507	Millar Channel, 2km S Hayden Passage	1408719	2.3
Cermaq Canada Ltd	1507	Millar Channel, 2km S Hayden Passage	1408719	2.3

Cermaq Canada Ltd	1507	Millar Channel, 2km S Hayden Passage	1408719	2.3
Cermaq Canada Ltd	1507	Millar Channel, 2km S Hayden Passage	1408719	2.3
Cermaq Canada Ltd	1507	Millar Channel, 2km S Hayden Passage	1408719	2.3
Cermaq Canada Ltd	1507	Millar Channel, 2km S Hayden Passage	1408719	2.3
Cermaq Canada Ltd	1507	Millar Channel, 2km S Hayden Passage	1408719	2.3
Cermaq Canada Ltd	1507	Millar Channel, 2km S Hayden Passage	1408719	2.3
Marine Harvest Canada Ltd	1237	Monday Rocks, Quatsino Sound	1406960	2.4
Marine Harvest Canada Ltd	1237	Monday Rocks, Quatsino Sound	1406960	2.4
Marine Harvest Canada Ltd	1237	Monday Rocks, Quatsino Sound	1406960	2.4
Marine Harvest Canada Ltd	1237	Monday Rocks, Quatsino Sound	1406960	2.4
Marine Harvest Canada Ltd	1237	Monday Rocks, Quatsino Sound	1406960	2.4
Marine Harvest Canada Ltd	1237	Monday Rocks, Quatsino Sound	1406960	2.4
Marine Harvest Canada Ltd	1237	Monday Rocks, Quatsino Sound	1406960	2.4
Grieg Seafood BC Ltd.	1849	Muchalat Inlet North, Nootka Sound	1411168	2.4
Grieg Seafood BC Ltd.	1849	Muchalat Inlet North, Nootka Sound	1411168	2.4
Grieg Seafood BC Ltd.	1849	Muchalat Inlet North, Nootka Sound	1411168	2.4
Grieg Seafood BC Ltd.	1700	Muchalat Inlet South, Nootka District	1411064	2.4
Grieg Seafood BC Ltd.	1700	Muchalat Inlet South, Nootka District	1411064	2.4
Grieg Seafood BC Ltd.	1700	Muchalat Inlet South, Nootka District	1411064	2.4
Grieg Seafood BC Ltd.	1700	Muchalat Inlet South, Nootka District	1411064	2.4
Grieg Seafood BC Ltd.	1700	Muchalat Inlet South, Nootka District	1411064	2.4
Grieg Seafood BC Ltd.	1700	Muchalat Inlet South, Nootka District	1411064	2.4
Cermaq Canada Ltd	543	Mussel Rock, Clayoquot Sound	1401589	2.3
Cermaq Canada Ltd	543	Mussel Rock, Clayoquot Sound	1401589	2.3
Cermaq Canada Ltd	543	Mussel Rock, Clayoquot Sound	1401589	2.3
Cermaq Canada Ltd	543	Mussel Rock, Clayoquot Sound	1401589	2.3
Cermaq Canada Ltd	543	Mussel Rock, Clayoquot Sound	1401589	2.3
Cermaq Canada Ltd	543	Mussel Rock, Clayoquot Sound	1401589	2.3
Grieg Seafood BC Ltd.	1825	Noo-La, Clio Channel	1411154	3.3
Marine Harvest Canada Ltd	78	Phillips Arm, Cardero Channel	2403170	3.2
Marine Harvest Canada Ltd	78	Phillips Arm, Cardero Channel	2403170	3.2
Marine Harvest Canada Ltd	78	Phillips Arm, Cardero Channel	2403170	3.2
Cermaq Canada Ltd	6668	Plover Point, Fortune Channel,	1413555	2.3
Cermaq Canada Ltd	6668	Plover Point, Fortune Channel,	1413555	2.3
Marine Harvest Canada Ltd	141	Port Elizabeth, Gilford Island	1403104	3.3
Marine Harvest Canada Ltd	141	Port Elizabeth, Gilford Island	1403104	3.3
Marine Harvest Canada Ltd	1145	Potts Bay, Midsummer Island	1406655	3.3
Marine Harvest Canada Ltd	1145	Potts Bay, Midsummer Island	1406655	3.3
Marine Harvest Canada Ltd	1145	Potts Bay, Midsummer Island	1406655	3.3
Marine Harvest Canada Ltd	1145	Potts Bay, Midsummer Island	1406655	3.3
Marine Harvest Canada Ltd	1145	Potts Bay, Midsummer Island	1406655	3.3
Marine Harvest Canada Ltd	1145	Potts Bay, Midsummer Island	1406655	3.3
Marine Harvest Canada Ltd	1145	Potts Bay, Midsummer Island	1406655	3.3
Marine Harvest Canada Ltd	1145	Potts Bay, Midsummer Island	1406655	3.3
Marine Harvest Canada Ltd	1145	Potts Bay, Midsummer Island	1406655	3.3
Cermaq Canada Ltd	526	Rant Point, Clayoquot Sound	1403262	2.3

Cermaq Canada Ltd	526	Rant Point, Clayoquot Sound	1403262	2.3
Cermaq Canada Ltd	526	Rant Point, Clayoquot Sound	1403262	2.3
Cermaq Canada Ltd	526	Rant Point, Clayoquot Sound	1403262	2.3
Cermaq Canada Ltd	526	Rant Point, Clayoquot Sound	1403262	2.3
Cermaq Canada Ltd	526	Rant Point, Clayoquot Sound	1403262	2.3
irine Harvest Canada I	1198	Raynor	NA	3.4
irine Harvest Canada I	1198	Raynor	NA	3.4
Cermaq Canada Ltd	304	Raza Island, Raza Passage	2403035	3.2
Cermaq Canada Ltd	304	Raza Island, Raza Passage	2403035	3.2
Cermaq Canada Ltd	304	Raza Island, Raza Passage	2403035	3.2
Cermaq Canada Ltd	314	Ross Pass, Northeast McKay Island	1405933	2.3
Cermaq Canada Ltd	314	Ross Pass, Northeast McKay Island	1405933	2.3
Cermaq Canada Ltd	314	Ross Pass, Northeast McKay Island	1405933	2.3
Cermaq Canada Ltd	314	Ross Pass, Northeast McKay Island	1405933	2.3
Cermaq Canada Ltd	314	Ross Pass, Northeast McKay Island	1405933	2.3
Cermaq Canada Ltd	314	Ross Pass, Northeast McKay Island	1405933	2.3
Cermaq Canada Ltd	314	Ross Pass, Northeast McKay Island	1405933	2.3
Cermaq Canada Ltd	314	Ross Pass, Northeast McKay Island	1405933	2.3
Grieg Seafood BC Ltd.	332	Salten, Northwest Sechelt Inlet	2402424	3.1
Grieg Seafood BC Ltd.	332	Salten, Northwest Sechelt Inlet	2402424	3.1
Grieg Seafood BC Ltd.	332	Salten, Northwest Sechelt Inlet	2402424	3.1
Cermaq Canada Ltd	527	Saranac Island, NW of Meares Island	1401590	2.3
Cermaq Canada Ltd	527	Saranac Island, NW of Meares Island	1401590	2.3
Cermaq Canada Ltd	527	Saranac Island, NW of Meares Island	1401590	2.3
Cermaq Canada Ltd	527	Saranac Island, NW of Meares Island	1401590	2.3
Cermaq Canada Ltd	527	Saranac Island, NW of Meares Island	1401590	2.3
Cermaq Canada Ltd	527	Saranac Island, NW of Meares Island	1401590	2.3
Cermaq Canada Ltd	527	Saranac Island, NW of Meares Island	1401590	2.3
Cermaq Canada Ltd	527	Saranac Island, NW of Meares Island	1401590	2.3
irine Harvest Canada I	1059	Sargeaunt Passage, Tribune Channel	1403328	3.3
irine Harvest Canada I	1059	Sargeaunt Passage, Tribune Channel	1403328	3.3
irine Harvest Canada I	1059	Sargeaunt Passage, Tribune Channel	1403328	3.3
irine Harvest Canada I	1059	Sargeaunt Passage, Tribune Channel	1403328	3.3
irine Harvest Canada I	1059	Sargeaunt Passage, Tribune Channel	1403328	3.3
irine Harvest Canada I	1895	Sheep Passage in vicinity of Pooley Isl.	6407839	3.5
irine Harvest Canada I	1895	Sheep Passage in vicinity of Pooley Isl.	6407839	3.5
irine Harvest Canada I	1895	Sheep Passage in vicinity of Pooley Isl.	6407839	3.5
irine Harvest Canada I	1895	Sheep Passage in vicinity of Pooley Isl.	6407839	3.5
irine Harvest Canada I	1895	Sheep Passage in vicinity of Pooley Isl.	6407839	3.5
irine Harvest Canada I	1895	Sheep Passage in vicinity of Pooley Isl.	6407839	3.5
irine Harvest Canada I	1895	Sheep Passage in vicinity of Pooley Isl.	6407839	3.5
irine Harvest Canada I	1350	Shelter Bay, Richards Channel	1407748	3.4
irine Harvest Canada I	1350	Shelter Bay, Richards Channel	1407748	3.4

arine Harvest Canada I	1350	Shelter Bay, Richards Channel	1407748	3.4
arine Harvest Canada I	831	Shelter Passage, Wishart Island	1404091	3.4
arine Harvest Canada I	831	Shelter Passage, Wishart Island	1404091	3.4
arine Harvest Canada I	831	Shelter Passage, Wishart Island	1404091	3.4
arine Harvest Canada I	831	Shelter Passage, Wishart Island	1404091	3.4
Cermaq Canada Ltd	728	Sir Edmund Bay, NE Shore Broughton Inlet	1404179	3.3
Cermaq Canada Ltd	728	Sir Edmund Bay, NE Shore Broughton Inlet	1404179	3.3
Cermaq Canada Ltd	728	Sir Edmund Bay, NE Shore Broughton Inlet	1404179	3.3
Grieg Seafood BC Ltd.	746	Site 13, Sechelt Inlet	2402591	3.1
Grieg Seafood BC Ltd.	746	Site 13, Sechelt Inlet	2402591	3.1
arine Harvest Canada I	380	Sonora Pt., Nodales Channel	1403325	3.2
arine Harvest Canada I	380	Sonora Pt., Nodales Channel	1403325	3.2
arine Harvest Canada I	211	Sonora Island, Okisollo Channel	1403325	3.2
arine Harvest Canada I	211	Sonora Island, Okisollo Channel	1403325	3.2
arine Harvest Canada I	211	Sonora Island, Okisollo Channel	1403325	3.2
arine Harvest Canada I	211	Sonora Island, Okisollo Channel	1403325	3.2
arine Harvest Canada I	211	Sonora Island, Okisollo Channel	1403325	3.2
arine Harvest Canada I	211	Sonora Island, Okisollo Channel	1403325	3.2
arine Harvest Canada I	211	Sonora Island, Okisollo Channel	1403325	3.2
arine Harvest Canada I	211	Sonora Island, Okisollo Channel	1403325	3.2
arine Harvest Canada I	211	Sonora Island, Okisollo Channel	1403325	3.2
arine Harvest Canada I	380	Sonora Pt., Nodales Channel	1403325	3.2
arine Harvest Canada I	380	Sonora Pt., Nodales Channel	1403144	3.2
arine Harvest Canada I	380	Sonora Pt., Nodales Channel	1403144	3.2
arine Harvest Canada I	380	Sonora Pt., Nodales Channel	1403144	3.2
arine Harvest Canada I	380	Sonora Pt., Nodales Channel	1403144	3.2
Grieg Seafood BC Ltd.	1079	Steamer Point, Hecate Channel	1404969	2.4
Grieg Seafood BC Ltd.	1079	Steamer Point, Hecate Channel	1404969	2.4
Grieg Seafood BC Ltd.	1079	Steamer Point, Hecate Channel	1404969	2.4
arine Harvest Canada I	465	Swanson Island, North side	1404381	3.3
arine Harvest Canada I	465	Swanson Island, North side	1404381	3.3
arine Harvest Canada I	465	Swanson Island, North side	1404381	3.3
arine Harvest Canada I	465	Swanson Island, North side	1404381	3.3
Grieg Seafood BC Ltd.	221	Vantage Point, Sechelt Inlet	2402095	3.1
Grieg Seafood BC Ltd.	221	Vantage Point, Sechelt Inlet	2402095	3.1
Cermaq Canada Ltd	306	Venture Point, Sonora Island	1403267	3.2
Cermaq Canada Ltd	306	Venture Point, Sonora Island	1403267	3.2
Cermaq Canada Ltd	306	Venture Point, Sonora Island	1403267	3.2
Cermaq Canada Ltd	306	Venture Point, Sonora Island	1403267	3.2
Cermaq Canada Ltd	306	Venture Point, Sonora Island	1403267	3.2
Cermaq Canada Ltd	306	Venture Point, Sonora Island	1403267	3.2
Cermaq Canada Ltd	306	Venture Point, Sonora Island	1403267	3.2
Cermaq Canada Ltd	306	Venture Point, Sonora Island	1403267	3.2
Cermaq Canada Ltd	306	Venture Point, Sonora Island	1403267	3.2
Grieg Seafood BC Ltd.	1839	Wa-kwa	1411170	3.3
arine Harvest Canada I	7054	Wanx talis (Heath Bay)	1414225	3.4
Cermaq Canada Ltd	1472	West Side, Bedwell Sound	1408492	2.3
Cermaq Canada Ltd	1472	West Side, Bedwell Sound	1408492	2.3

Cermaq Canada Ltd	1472	West Side, Bedwell Sound	1408492	2.3
irine Harvest Canada I	820	Wicklow Point, Broughton Island	1405183	3.3
irine Harvest Canada I	820	Wicklow Point, Broughton Island	1405183	3.3
irine Harvest Canada I	820	Wicklow Point, Broughton Island	1405183	3.3
irine Harvest Canada I	820	Wicklow Point, Broughton Island	1405183	3.3
Grieg Seafood BC Ltd.	1705	Williamson Passage, Nootka Sound	1411068	2.4
Grieg Seafood BC Ltd.	1705	Williamson Passage, Nootka Sound	1411068	2.4
Grieg Seafood BC Ltd.	1705	Williamson Passage, Nootka Sound	1411068	2.4

Species	BroodProduction	Year	Calendar Month	Therapeutant	WeightActiveTherapeutant_Kg	FishHealthCat	OccurrenceCat	MitigativeAction	Dosage
Atlantic Salmon	Production	2012	NOV	Emamectin					
Atlantic Salmon	Production	2013	MAY	Emamectin	0.55275				
Atlantic Salmon	Production	2014	MAR	Emamectin	0.11697				
Atlantic Salmon	Production	2014	NOV	Emamectin	0.65				
Atlantic Salmon	Production	2011	APR	Emamectin					
Atlantic Salmon	Production	2014	FEB	Emamectin	0.0731				
Atlantic Salmon	Production	2015	OCT	Emamectin	0.329				
Atlantic Salmon	Production >	2016	JUN	Emamectin	0.228				
Atlantic Salmon	Production >	2018	FEB	Emamectin	0.28	Event New	3	ns tre/Kg/fi	
Atlantic Salmon	Production	2011	OCT	Emamectin					
Atlantic Salmon	Production	2012	APR	Emamectin					
Atlantic Salmon	Production	2015	APR	Emamectin	0.73722				
Atlantic Salmon	Production	2015	DEC	Emamectin	1.3446				
Atlantic Salmon	Production >	2017	JAN	Emamectin	0.50048	Event New	3	ns tre/kg; ;	
Atlantic Salmon	Production >	2017	OCT	Emamectin	0.005019	Event New	3	ns tre/kg; ;	
Atlantic Salmon	Production >	2017	NOV	Emamectin	0.821095	Event New	3	ns tre/kg; ;	
Atlantic Salmon	Production	2011	DEC	Emamectin		Event			
Atlantic Salmon	Production	2015	AUG	Emamectin	0.3358				
Atlantic Salmon	Production >	2011	SEP	Emamectin					
Atlantic Salmon	Production >	2016	MAR	Emamectin	0.1474				
Atlantic Salmon	Production >	2016	APR	Emamectin	0.208				
Atlantic Salmon	Production	2012	FEB	Emamectin					
Atlantic Salmon	Production	2014	AUG	Emamectin	0.4484				
Atlantic Salmon	Production	2014	NOV	Emamectin	0.2975				
Atlantic Salmon	Production	2014	DEC	Emamectin	0.3064				
Atlantic Salmon	Production	2015	OCT	Emamectin	0.26				
Atlantic Salmon	Production >	2016	MAY	Emamectin	0.5558				
Atlantic Salmon	Production >	2017	NOV	Emamectin	0.439	Event New	3	ns tre/kg/fi	
Atlantic Salmon	Production	2011	OCT	Emamectin					
Atlantic Salmon	Production	2014	MAY	Emamectin	0.537				
Atlantic Salmon	Production	2015	SEP	Emamectin	0.092				
Atlantic Salmon	Production >	2016	FEB	Emamectin	0.3311				
Atlantic Salmon	Production <	2017	JUN	Emamectin	0.052	Event New	3	ns tre/kg; ;	
Atlantic Salmon	Production >	2018	FEB	Emamectin	0.38	Event New	3	ns tre/kg; ;	
Atlantic Salmon	Production	2011	SEP	Emamectin					
Atlantic Salmon	Production	2015	JUL	Emamectin	0.295				
Atlantic Salmon	Production	2015	DEC	Emamectin	0.64				
Atlantic Salmon	Production	2013	FEB	Emamectin	0.3006				
Atlantic Salmon	Production	2014	FEB	Emamectin	0.039				

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Atlantic Salmon	Production	2014	DEC	Emamectin	0.38948	
Atlantic Salmon	Production <	2011	MAY	Emamectin		
Atlantic Salmon	Production <	2016	MAR	Emamectin	0.0777	
Atlantic Salmon	Production >	2017	APR	Emamectin	0.518	Event View 'J pens fish/d
Atlantic Salmon	Production	2011	SEP	Emamectin		
Atlantic Salmon	Production	2012	MAR	Emamectin		
Atlantic Salmon	Production	2013	AUG	Emamectin	0.11	
Atlantic Salmon	Production	2014	FEB	Emamectin	0.43	
Atlantic Salmon	Production	2014	JUL	Emamectin	0.94435	
Atlantic Salmon	Production	2015	SEP	Emamectin	0.199	
Atlantic Salmon	Production >	2016	MAR	Emamectin	0.1965	
Atlantic Salmon	Production >	2016	APR	Emamectin	0.8	
Atlantic Salmon	Production >	2017	NOV	Emamectin	0.3479	Event View 'ens trefish/d
Atlantic Salmon	Production	2012	FEB	Emamectin		
Atlantic Salmon	Production	2013	NOV	Emamectin	0.584	
Atlantic Salmon	Production	2015	MAY	Emamectin	0.542	
Atlantic Salmon	Production >	2017	JAN	Emamectin	0.575	Event View 'ens trefish/d;
Atlantic Salmon	Brood	2013	JUN	Emamectin	0.05	
Atlantic Salmon	Brood	2015	APR	Emamectin	0.124	
Atlantic Salmon	Production >	2011	MAY	Emamectin		
Atlantic Salmon	Production >	2016	NOV	Emamectin	0.6089	Event View 'ens trefish/d
Atlantic Salmon	Production	2011	DEC	Emamectin		
Atlantic Salmon	Production	2013	OCT	Emamectin	0.28	
Atlantic Salmon	Production	2015	MAR	Emamectin	0.17	
Atlantic Salmon	Production	2015	AUG	Emamectin	0.3864	
Atlantic Salmon	Production >	2018	JAN	Emamectin	0.825	Event View 'ens trefish/d
Atlantic Salmon	Production	2011	APR	Emamectin		
Atlantic Salmon	Production	2015	OCT	Emamectin	0.161	
Atlantic Salmon	Production >	2016	JUN	Emamectin	0.34125	
Atlantic Salmon	Production >	2018	FEB	Emamectin	0.39	Event View 'ens trefish/d
Atlantic Salmon	Brood	2017	FEB	Emamectin	0.028	Event View 'J pens fish/d;
Atlantic Salmon	Brood	2017	FEB	Emamectin	0.03	Event View 'J pens fish/d;
Atlantic Salmon	Production	2011	NOV	Emamectin		
Atlantic Salmon	Production	2012	MAY	Emamectin		
Atlantic Salmon	Production	2013	JAN	Emamectin	0.9697	
Atlantic Salmon	Production	2013	MAY	Emamectin	0.118	
Atlantic Salmon	Production	2015	OCT	Emamectin	0.506	
Atlantic Salmon	Production >	2017	JUN	Emamectin	0.389	Event View 'J pens fish/d;
Atlantic Salmon	Production >	2017	SEP	Emamectin	0.644	Event View 'ens trefish/d
Atlantic Salmon	Production >	2017	OCT	Emamectin	0.644	Event View 'ens trefish/d
Atlantic Salmon	Production	2013	JAN	Emamectin	0.313	
Atlantic Salmon	Production	2015	FEB	Emamectin	0.446487	
Atlantic Salmon	Production <	2016	MAY	Emamectin	0.0501	
Atlantic Salmon	Production >	2017	FEB	Emamectin	0.538521	Event View 'ens trefish/d;
Atlantic Salmon	Production	2012	SEP	Emamectin		
Atlantic Salmon	Production	2014	DEC	Emamectin	0.381175	
Atlantic Salmon	Production	2015	JUN	Emamectin	0.053496	

Atlantic Salmon	Production	2015	JUL	Emamectin	0.813819	
Atlantic Salmon	Production > [REDACTED]	2017	MAR	Emamectin	0.478	Event New ʒns trεg/kg;
Atlantic Salmon	Production	2014	DEC	Emamectin	0.691812	
Atlantic Salmon	Production	2015	JUL	Emamectin	1.271718	
Atlantic Salmon	Production > [REDACTED]	2017	FEB	Emamectin	0.534688	Event New ʒns trεg/kg;
Atlantic Salmon	Production > [REDACTED]	2017	MAR	Emamectin	1.29	Event New ʒns trεg/kg;
Atlantic Salmon	Production	2014	AUG	Emamectin	0.2262	
Atlantic Salmon	Production	2014	DEC	Emamectin	0.65247	
Atlantic Salmon	Production > [REDACTED]	2016	SEP	Emamectin	0.4	Event New *
Atlantic Salmon	Production	2015	JUN	Emamectin	0.706	
Atlantic Salmon	Production > [REDACTED]	2017	FEB	Emamectin	0.493	Event New ʒns trεish/d;
Atlantic Salmon	Production > [REDACTED]	2016	JUL	Emamectin	1.127439	0.1
Atlantic Salmon	Production < [REDACTED]	2017	OCT	Emamectin	0.584288	Event New ʒns trεg/kg;
Atlantic Salmon	Brood	2016	FEB	Emamectin	0.053256	
Atlantic Salmon	Brood	2017	FEB	Emamectin	0.066904	Event New ʒns trεg/kg;
Atlantic Salmon	Production	2011	DEC	Emamectin		
Atlantic Salmon	Production	2014	JAN	Emamectin	0.27825	
Atlantic Salmon	Production	2015	JUN	Emamectin	0.146709	
Atlantic Salmon	Production	2016	FEB	Emamectin	0.70602	
Atlantic Salmon	Production > [REDACTED]	2016	JUN	Emamectin	0.001338	
Atlantic Salmon	Production > [REDACTED]	2018	MAR	Emamectin	0.55352	Event New ʒns trεg/kg; :
Atlantic Salmon	Production	2011	OCT	Emamectin		
Atlantic Salmon	Production	2012	MAY	Emamectin		
Atlantic Salmon	Production	2012	OCT	Emamectin		
Atlantic Salmon	Production	2014	JAN	Emamectin	0.52836	
Atlantic Salmon	Production	2015	NOV	Emamectin	0.7315	
Atlantic Salmon	Production > [REDACTED]	2016	MAY	Emamectin	1.05672	
Atlantic Salmon	Production	2011	NOV	Emamectin		
Atlantic Salmon	Production	2013	NOV	Emamectin	0.143395	
Atlantic Salmon	Production	2014	NOV	Emamectin	0.1984	
Atlantic Salmon	Production > [REDACTED]	2017	OCT	Emamectin	0.821	Event New ʒns trε/kg/fi
Atlantic Salmon	Production	2011	MAY	Emamectin		
Atlantic Salmon	Production	2013	JAN	Emamectin	0.241	
Atlantic Salmon	Production	2013	DEC	Emamectin	1.1322	
Atlantic Salmon	Production	2015	JAN	Emamectin	0.0629	
Atlantic Salmon	Production	2015	APR	Emamectin	0.88243	
Atlantic Salmon	Production	2015	DEC	Emamectin	1.61376	
Atlantic Salmon	Production > [REDACTED]	2016	NOV	Emamectin	0.537891	New ʒns trεMB/l
Atlantic Salmon	Production	2011	DEC	Emamectin		
Atlantic Salmon	Production	2014	JAN	Emamectin	1.09446	
Atlantic Salmon	Production	2016	FEB	Emamectin	0.145991	
Atlantic Salmon	Production	2016	MAR	Emamectin	1.0693	

Atlantic Salmon	Production > [REDACTED]	2018	MAR	Emamectin	0.870422	Event New pens tre/kg; :
Atlantic Salmon	Production	2014	OCT	Emamectin	0.028174	
Atlantic Salmon	Production	2011	OCT	Emamectin	0.309	
Atlantic Salmon	Production	2012	APR	Emamectin	0.309	
Atlantic Salmon	Production	2013	SEP	Emamectin	0.309	
Atlantic Salmon	Production	2014	JAN	Emamectin	0.80688	
Atlantic Salmon	Production	2015	JUN	Emamectin	0.040181	
Atlantic Salmon	Production	2015	JUL	Emamectin	0.437363	
Atlantic Salmon	Production	2015	NOV	Emamectin	0.91299	
Atlantic Salmon	Production	2011	SEP	Emamectin		
Atlantic Salmon	Production	2012	MAY	Emamectin		
Atlantic Salmon	Production	2013	MAR	Emamectin	0.05	
Atlantic Salmon	Production	2013	NOV	Emamectin	0.238216	
Atlantic Salmon	Production	2014	FEB	Emamectin	0.90576	
Atlantic Salmon	Production	2015	APR	Emamectin	0.2511	
Atlantic Salmon	Production > [REDACTED]	2017	NOV	Emamectin	1.526459	New pens tre/kg;
Atlantic Salmon	Production	2011	MAY	Emamectin		
Atlantic Salmon	Production	2015	MAR	Emamectin	0.80584	
Atlantic Salmon	Production > [REDACTED]	2016	JUN	Emamectin	0.000803	
Atlantic Salmon	Production > [REDACTED]	2016	NOV	Emamectin	0.86292	New pens treMB/l
Atlantic Salmon	Production	2011	OCT	Emamectin		
Atlantic Salmon	Production	2015	MAY	Emamectin	0.86	
Atlantic Salmon	Production	2014	JAN	Emamectin	0.10881	
Atlantic Salmon	Production	2015	MAR	Emamectin	0.03013	
Atlantic Salmon	Production > [REDACTED]	2017	NOV	Emamectin	1.0251	New pens tre/kg;
Atlantic Salmon	Production	2012	NOV	Emamectin	0.657504	
Atlantic Salmon	Production	2013	APR	Emamectin	0.657504	
Atlantic Salmon	Production	2014	FEB	Emamectin	0.07524	
Atlantic Salmon	Production	2014	NOV	Emamectin	0.43232	
Atlantic Salmon	Production	2011	JUL	Emamectin		
Atlantic Salmon	Production	2014	SEP	Emamectin	1.14757	
Atlantic Salmon	Production	2015	NOV	Emamectin	0.28215	
Atlantic Salmon	Production > [REDACTED]	2016	MAY	Emamectin	0.9817	
Atlantic Salmon	Production	2013	MAR	Emamectin	0.1973	
Atlantic Salmon	Production > [REDACTED]	2017	FEB	Emamectin	0.447	Event New pens treish/di
Atlantic Salmon	Production	2011	NOV	Emamectin	0.32708	
Atlantic Salmon	Production	2014	FEB	Emamectin	0.32708	
Atlantic Salmon	Production	2015	FEB	Emamectin	1.23757	
Atlantic Salmon	Production	2016	FEB	Emamectin	0.60384	
Atlantic Salmon	Production > [REDACTED]	2017	FEB	Emamectin	0.085017	Event New pensg/kg;
Atlantic Salmon	Production > [REDACTED]	2018	MAR	Emamectin	0.874912	Event New pens tre/kg; :
Atlantic Salmon	Production	2013	MAY	Emamectin	0.056	
Atlantic Salmon	Production	2013	AUG	Emamectin	0.254	

Atlantic Salmon	Production	2014	MAY	Emamectin	0.386	
Atlantic Salmon	Production	2015	SEP	Emamectin	0.399	
Atlantic Salmon	Production >	2016	APR	Emamectin	0.263	
Atlantic Salmon	Production >	2016	MAY	Emamectin	0.545	
Atlantic Salmon	Production >	2017	JUN	Emamectin	0.249	Event New 3ns treish/d
Atlantic Salmon	Production >	2017	SEP	Emamectin	0.495	Event New 3ns trefish/d
Atlantic Salmon	Production	2011	SEP	Emamectin		
Atlantic Salmon	Production	2012	MAR	Emamectin		
Atlantic Salmon	Production	2013	FEB	Emamectin	0.1338	
Atlantic Salmon	Production	2013	NOV	Emamectin	0.513885	
Atlantic Salmon	Production	2014	FEB	Emamectin	1.02309	
Atlantic Salmon	Production	2015	APR	Emamectin	0.20793	
Atlantic Salmon	Production >	2017	NOV	Emamectin	1.00307	New 3ns tre3/kg;
Atlantic Salmon	Production	2014	SEP	Emamectin	0.2888	
Atlantic Salmon	Production	2015	FEB	Emamectin	0.78164	
Atlantic Salmon	Production	2015	MAR	Emamectin	0.0113	
Atlantic Salmon	Production	2013	JAN	Emamectin	0.525	
Atlantic Salmon	Production	2014	SEP	Emamectin	0.3367	
Atlantic Salmon	Production	2015	FEB	Emamectin	0.24928	
Atlantic Salmon	Production	2015	MAR	Emamectin	0.52	
Atlantic Salmon	Production >	2018	FEB	Emamectin	0.125	Event New 3ns tre/Kg/fi
Atlantic Salmon	Production >	2018	MAR	Emamectin	0.315	Event going3ns tre/kg/fi
Atlantic Salmon	Production	2011	AUG	Emamectin		
Atlantic Salmon	Production	2013	JUL	Emamectin	0.305	
Atlantic Salmon	Production	2015	JUL	Emamectin	0.313	
Atlantic Salmon	Production	2015	DEC	Emamectin	0.704	
Atlantic Salmon	Production >	2017	MAY	Emamectin	0.201	Event New 3ns treish/d
Atlantic Salmon	Production >	2017	SEP	Emamectin	0.516	Event New 3ns trefish/d
Atlantic Salmon	Production >	2017	FEB	Emamectin	0.7007	Event New 3ns tre143g,
Atlantic Salmon	Production	2013	JAN	Emamectin	0.761	
Atlantic Salmon	Production	2015	JAN	Emamectin	0.761231	
Atlantic Salmon	Production >	2016	DEC	Emamectin	0.502272	Event New 3ns treig/kg;
Atlantic Salmon	Production	2015	SEP	Emamectin	0.165	
Atlantic Salmon	Production >	2016	FEB	Emamectin	0.5208	
Atlantic Salmon	Production	2015	MAY	Emamectin	0.33	
Atlantic Salmon	Production	2016	FEB	Emamectin	0.260195	
Atlantic Salmon	Breed	2013	JAN	Emamectin	0.05	
Atlantic Salmon	Breed	2014	JAN	Emamectin	0.01258	
Atlantic Salmon	Breed	2014	NOV	Emamectin	0.026038	
Atlantic Salmon	Breed	2015	APR	Emamectin	0.068394	
Atlantic Salmon	Breed	2016	JAN	Emamectin	0.01887	
Atlantic Salmon	Breed	2016	FEB	Emamectin	0.056107	
Atlantic Salmon	Breed	2017	FEB	Emamectin	0.04275	Event New 31 pensg/kg;
Atlantic Salmon	Breed	2017	DEC	Emamectin	0.005043	Event New 3ns treig/kg;
Atlantic Salmon	Breed	2017	DEC	Emamectin	0.01258	Event New 31 pens3/kg;
Atlantic Salmon	Production	2011	JUN	Emamectin		

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Atlantic Salmon	Production	2013	JUL	Emamectin	0.593	
Atlantic Salmon	Production	2015	MAY	Emamectin	0.628	
Atlantic Salmon	Production <	2017	MAY	Emamectin	0.029	Event New 'ens treish/di
Atlantic Salmon	Production <	2017	JUN	Emamectin	0.069	Event goingens treish/di
Atlantic Salmon	Production >	2017	SEP	Emamectin	0.159	Event New 'ens tre3/kg/f
Atlantic Salmon	Production	2011	NOV	Emamectin		
Atlantic Salmon	Production	2012	OCT	Emamectin		
Atlantic Salmon	Production	2013	MAR	Emamectin	0.62832	
Atlantic Salmon	Production >	2017	JAN	Emamectin	0.045	Event goingpensish/di
Atlantic Salmon	Production >	2017	JAN	Emamectin	0.674	Event New 'l pensish/di
Atlantic Salmon	Production	2011	OCT	Emamectin		
Atlantic Salmon	Production	2013	MAY	Emamectin	0.109	
Atlantic Salmon	Production	2013	SEP	Emamectin	0.37	
Atlantic Salmon	Production	2015	OCT	Emamectin	0.409	
Atlantic Salmon	Production >	2016	FEB	Emamectin	0.684	
Atlantic Salmon	Production >	2017	JUN	Emamectin	0.228	Event New 'l pensish/di
Atlantic Salmon	Production >	2017	SEP	Emamectin	0.365	Event New 'ens tre3/kg/f
Atlantic Salmon	Production >	2017	OCT	Emamectin	0.365	Event New 'ens trefish/d
Atlantic Salmon	Production	2015	SEP	Emamectin	0.15692	
Atlantic Salmon	Production >	2017	APR	Emamectin	0.153094	Event New 'ens tre3/kg/f
Atlantic Salmon	Production >	2018	MAR	Emamectin	0.23	Event New 'ens tre/Kg/fi
Atlantic Salmon	Production	2011	AUG	Emamectin		
Atlantic Salmon	Production	2012	MAR	Emamectin		
Atlantic Salmon	Production	2013	MAY	Emamectin	0.406	
Atlantic Salmon	Production	2013	AUG	Emamectin	0.66	
Atlantic Salmon	Production	2015	MAY	Emamectin	0.643	
Atlantic Salmon	Production <	2016	JUL	Emamectin	0.06	Event New 'ens treish/di
Atlantic Salmon	Production >	2017	JUN	Emamectin	0.208	Event New 'l pensish/di
Atlantic Salmon	Production >	2017	SEP	Emamectin	0.534	Event New 'ens trefish/d
Atlantic Salmon	Production	2012	JAN	Emamectin		
Atlantic Salmon	Production	2014	JAN	Emamectin	1.3608	
Atlantic Salmon	Production	2016	FEB	Emamectin	0.371336	
Atlantic Salmon	Production	2016	MAR	Emamectin	1.423503	
Atlantic Salmon	Production >	2018	MAR	Emamectin	1.596614	Event New 'ens treg/kg;
Atlantic Salmon	Production	2013	FEB	Emamectin	1.0073	
Atlantic Salmon	Production	2013	MAY	Emamectin	1.3838	
Atlantic Salmon	Production	2013	OCT	Emamectin	0.234628	
Atlantic Salmon	Production	2013	NOV	Emamectin	0.904716	
Atlantic Salmon	Production	2014	OCT	Emamectin	0.63294	
Atlantic Salmon	Production >	2016	JUN	Emamectin	0.37665	
Atlantic Salmon	Production >	2017	JUN	Emamectin	1.097094	Event New 'ens treg/kg;
Atlantic Salmon	Production	2011	NOV	Emamectin		
Atlantic Salmon	Production	2013	DEC	Emamectin	0.52041	

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Atlantic Salmon	Production	2016	MAR	Emamectin	0.854434	
Atlantic Salmon	Production	2011	DEC	Emamectin		
Atlantic Salmon	Production	2012	NOV	Emamectin		
Atlantic Salmon	Production	2014	OCT	Emamectin	0.316476	
Atlantic Salmon	Production > [REDACTED]	2017	MAR	Emamectin	0.544	Event New ʹns treig/kg;
Atlantic Salmon	Production	2013	MAR	Emamectin	0.26854	
Atlantic Salmon	Production	2015	MAR	Emamectin	0.375	
Atlantic Salmon	Production > [REDACTED]	2017	FEB	Emamectin	0.713	Event New ʹns treish/d;
Atlantic Salmon	Production	2015	SEP	Emamectin	0.074848	
Atlantic Salmon	Production > [REDACTED]	2018	MAR	Emamectin	0.087	Event New ʹns tre/Kg/fi
Atlantic Salmon	Production	2011	MAR	Emamectin		
Atlantic Salmon	Production	2011	AUG	Emamectin		
Atlantic Salmon	Production	2012	MAY	Emamectin		
Atlantic Salmon	Production	2013	JAN	Emamectin	0.277	
Atlantic Salmon	Production	2014	FEB	Emamectin	0.49062	
Atlantic Salmon	Production	2014	AUG	Emamectin	0.82455	
Atlantic Salmon	Production	2015	JAN	Emamectin	1.258901	
Atlantic Salmon	Production	2015	OCT	Emamectin	0.287035	
Atlantic Salmon	Production > [REDACTED]	2016	APR	Emamectin	0.80512	
Atlantic Salmon	Production > [REDACTED]	2017	NOV	Emamectin	0.877073	Event New ʹns tre3/kg;
Atlantic Salmon	Production	2012	MAY	Emamectin		
Atlantic Salmon	Production	2014	JUN	Emamectin	0.875187	
Atlantic Salmon	Production	2015	FEB	Emamectin	0.002352	
Atlantic Salmon	Production	2015	DEC	Emamectin	0.9408	
Atlantic Salmon	Production > [REDACTED]	2016	DEC	Emamectin	0.495007	Event New ʹns treig/kg;
Atlantic Salmon	Production	2014	AUG	Emamectin	0.1833	
Atlantic Salmon	Production	2014	DEC	Emamectin	0.52143	
Atlantic Salmon	Production > [REDACTED]	2016	SEP	Emamectin	0.3875	Event New *
Atlantic Salmon	Production	2013	JAN	Emamectin	0.213	
Atlantic Salmon	Production	2013	NOV	Emamectin	1.076962	
Atlantic Salmon	Production	2015	FEB	Emamectin	0.5585	
Atlantic Salmon	Production > [REDACTED]	2017	JAN	Emamectin	0.658865	Event New ʹns treig/kg;
Atlantic Salmon	Production	2015	SEP	Emamectin	0.11921	
Atlantic Salmon	Production > [REDACTED]	2018	MAR	Emamectin	0.143	Event New ʹns tre/Kg/fi
Atlantic Salmon	Production	2011	SEP	Emamectin		
Atlantic Salmon	Production	2012	MAR	Emamectin		
Atlantic Salmon	Production	2013	AUG	Emamectin	0.075	
Atlantic Salmon	Production	2014	FEB	Emamectin	0.292	
Atlantic Salmon	Production	2014	JUL	Emamectin	0.83325	
Atlantic Salmon	Production	2015	SEP	Emamectin	0.218	
Atlantic Salmon	Production > [REDACTED]	2016	MAR	Emamectin	0.245	
Atlantic Salmon	Production > [REDACTED]	2016	APR	Emamectin	0.84	
Atlantic Salmon	Production > [REDACTED]	2017	NOV	Emamectin	0.378	Event New ʹns trefish/d
Atlantic Salmon	Production > [REDACTED]	2017	FEB	Emamectin	0.35035	Event New ʹns tre143g,
Atlantic Salmon	Production > [REDACTED]	2017	DEC	Emamectin	0.474428	Event New ʹl pensg/kg;
Atlantic Salmon	Production > [REDACTED]	2011	AUG	Emamectin		
Atlantic Salmon	Production > [REDACTED]	2016	MAY	Emamectin	0.165	

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Atlantic Salmon	Production > 0.789	2017	FEB	Emamectin	0.789	Event New ³ns treish/d;
Atlantic	Production	2014	NOV	Emamectin	0.264	
Atlantic	Production	2015	JUL	Emamectin	3.112312	
Atlantic Salmon	Production > 0.517173	2017	JAN	Emamectin	0.517173	Event New ³ns treig/kg;
Atlantic Salmon	Production > 0.823162	2017	OCT	Emamectin	0.823162	Event New ³ns treig/kg;
Atlantic	Production	2011	DEC	Emamectin		
Atlantic	Production	2015	AUG	Emamectin	0.098	
Atlantic Salmon	Production > 0.705075	2016	APR	Emamectin	0.705075	

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uni.id	Pre- treatment MOTILE Abundance	Pre- treatment FEMALE Abundance	Pre- treatment CHALIMUS Abundance	Post- treatment MOTILE Abundance	Post- treatment FEMALE Abundance	Post- treatment CHALIMUS Abundance	Year Class
1338NOV2012	4.90	2.90	1.50	0.70	0.60	0.00	1
1338MAY2013	3.70	1.70	0.30	2.20	0.50	0.90	2
1338MAR2014	1.30	0.30	0.60	0.50	0.20	0.20	1
1338NOV2014	4.10	2.00	0.10	0.90	0.50	0.00	2
1698APR2011	2.00	0.40	0.00	0.30	0.10	0.20	2
1698FEB2014	0.50	0.20	0.10	0.00	0.00	0.00	1
1698OCT2015	3.90	2.30	0.00	0.10	0.10	0.00	1
1698JUN2016	4.80	1.80	0.30	0.00	0.00	0.00	2
1698FEB2018	1.16	0.73	0.24	0.20	0.09	0.02	1
1300OCT2011	3.60	1.50	8.90	0.40	0.20	0.00	1
1300APR2012	1.00	0.30	1.80	0.10	0.00	0.20	2
1300APR2015	2.80	1.50	1.40	0.40	0.20	0.90	2
1300DEC2015	4.80	2.20	0.20	1.40	0.90	0.00	2
1300JAN2017	4.02	2.17	0.00	0.13	0.04	0.00	1
1300OCT2017							
1300NOV2017	7.02	3.10	1.29	0.40	0.27	0.02	2
1738DEC2011	2.50	1.20	0.10	0.40	0.20	0.00	2
1738AUG2015	4.50	2.60	0.00	2.90	2.00	0.00	2
1537SEP2011	1.80	0.80	1.50	0.10	0.00	0.00	1
1537MAR2016							
1537APR2016	2.50	0.90	0.20	0.20	0.10	0.00	1
871FEB2012	3.40	1.10	1.90	0.20	0.00	0.00	1
871AUG2014	3.90	1.40	1.90	0.00	0.00	0.10	1
871NOV2014							
871DEC2014	1.00	0.40	0.00	0.20	0.10	0.00	2
871OCT2015	9.60	4.60	1.80	0.10	0.00	0.00	1
871MAY2016	1.60	0.70	2.70	0.10	0.00	0.10	2
871NOV2017	3.98	1.82	1.05	0.07	0.07	0.02	1
227OCT2011	3.40	2.10	0.20	0.10	0.10	0.00	1
227MAY2014	2.00	1.00	0.00	0.00	0.00	0.00	2
227SEP2015	8.50	4.30	0.30	0.10	0.10	0.00	1
227FEB2016	2.00	1.00	0.00	0.70	0.50	0.00	1
227JUN2017	1.85	0.19	0.31	0.18	0.08	0.03	1
227FEB2018	7.53	3.88	1.22	9.77	6.26	0.37	1
520SEP2011	3.30	1.40	4.10	0.20	0.10	0.00	1
520JUL2015	3.40	1.40	0.30	0.10	0.10	0.10	1
520DEC2015	0.90	0.50	0.00	0.10	0.10	0.00	2
1825FEB2013	1.00	0.50	0.10	0.10	0.10	0.00	1
1825FEB2014	3.00	2.00	0.00	0.90	0.40	0.00	2

1825DEC2014	2.30	0.90	0.90	0.20	0.00	0.00	1
1148MAY2011	2.00	1.80	1.40	0.00	0.00	0.00	2
1148MAR2016	0.60	0.10	0.10	0.20	0.00	0.00	1
1148APR2017	3.58	2.27	0.02	0.78	0.48	0.00	2
1401SEP2011	3.80	0.30	6.10	0.40	0.10	0.00	1
1401MAR2012	1.20	0.60	1.60	0.50	0.30	0.00	1
1401AUG2013	5.70	0.90	18.80	0.20	0.10	0.00	1
1401FEB2014	2.80	1.30	0.70	0.10	0.10	0.00	1
1401JUL2014	0.50	0.30	0.00	0.10	0.00	0.00	2
1401SEP2015	3.50	1.60	2.90	0.10	0.10	0.00	1
1401MAR2016							
1401APR2016	2.20	1.20	1.80	0.50	0.30	0.10	2
1401NOV2017	4.11	2.02	2.44	0.03	0.01	0.02	1
1144FEB2012	1.60	0.70	0.00	0.30	0.10	0.00	2
1144NOV2013	5.30	3.10	0.00	0.10	0.10	0.00	1
1144MAY2015	4.50	1.50	1.40	0.60	0.20	0.10	2
1144JAN2017	2.61	0.92	3.16	0.14	0.04	0.08	1
819JUN2013							
819APR2015							
790MAY2011	4.00	1.60	0.60	0.00	0.00	0.20	2
790NOV2016	8.40	4.60	3.00	0.32	0.27	0.00	2
1789DEC2011	1.10	0.50	0.20	0.60	0.20	0.00	1
1789OCT2013	4.80	1.60	0.10	0.70	0.40	0.00	1
1789MAR2015	0.50	0.10	0.00	0.40	0.00	0.10	1
1789AUG2015	3.90	2.10	0.00	1.70	1.30	0.10	1
1789JAN2018	4.38	1.90	0.00	1.17	0.47	0.01	2
1697APR2011	0.30	0.10	0.10	0.00	0.00	0.10	2
1697OCT2015	2.90	2.20	0.00	0.10	0.10	0.00	1
1697JUN2016	1.70	0.90	0.00	0.10	0.00	0.00	2
1697FEB2018	0.45	0.30	0.10	0.08	0.04	0.02	1
458FEB2017							
458FEB2017							
733NOV2011	6.50	2.90	3.50	0.20	0.10	0.00	1
733MAY2012	2.60	0.90	2.10	unknown			2
733JAN2013	7.50	4.40	0.70	0.60	0.30	0.00	2
234MAY2013	3.10	2.90	6.10	0.00	0.00	0.00	1
234OCT2015	10.40	3.50	0.80	1.40	0.80	0.00	2
234JUN2017	1.34	0.34	0.28	0.33	0.15	0.02	1
234SEP2017							
234OCT2017	3.62	1.84	0.11	2.82	2.01	0.00	2
1586JAN2013	0.40	0.10	0.60	0.00	0.00	0.10	1
1586FEB2015	3.20	1.30	5.10	0.20	0.10	0.10	2
1586MAY2016	2.40	0.40	7.60	0.30	0.10	0.20	1
1586FEB2017	2.14	0.53	5.48	0.43	0.17	0.30	1
1288SEP2012	8.40	2.30	14.00	0.60	0.30	0.00	2
1288DEC2014	7.50	4.10	0.60	0.00	0.00	0.10	2
1288JUN2015							

1288JUL2015	5.20	3.20	2.40	0.20	0.00	0.00	
1288MAR2017	3.97	1.51	1.65	0.59	0.32	0.05	
1293DEC2014	11.80	6.70	0.00	2.60	0.00	1.30	
1293JUL2015	3.50	1.60	1.10	0.00	0.00	0.00	
1293FEB2017							
1293MAR2017	4.35	2.28	1.58	0.56	0.28	0.02	
1863AUG2014	2.40	1.30	0.60	0.60	0.30	0.00	
1863DEC2014	0.60	0.40	0.00	0.00	0.00	0.00	
1863SEP2016	4.50	2.20	0.10	10.10	8.20	0.00	
540JUN2015	4.20	2.10	0.10	0.30	0.20	0.00	
540FEB2017	1.60	1.07	0.08	0.86	0.54	0.01	
7053JUL2016	5.90	3.10	4.40	0.20	0.10	0.00	
7053OCT2017	4.93	2.19	6.16	0.83	0.39	0.05	
303FEB2016							
303FEB2017							
821DEC2011	2.30	1.10	3.10	0.40	0.20	0.00	
821JAN2014	5.90	1.80	4.60	0.00	0.00	0.10	
821JUN2015	2.10	0.30	11.90	0.10	0.00	0.00	
821FEB2016	1.50	0.70	2.30	0.00	0.00	0.10	
821JUN2016							
821MAR2018	2.10	0.94	0.67	0.34	0.15	0.15	
1702OCT2011	1.70	0.50	1.40	0.10	0.00	0.10	
1702MAY2012	5.30	1.90	0.80	3.30	1.70	0.00	
1702OCT2012	9.50	5.90	0.00	11.70	6.90	0.00	
1702JAN2014	9.50	5.40	0.70	0.40	0.30	0.00	
1702NOV2015	1.60	0.60	0.40	0.70	0.40	0.00	
1702MAY2016	2.50	1.40	1.70	2.20	1.10	0.00	
892NOV2011	5.20	2.50	4.10	0.50	0.10	0.00	1
892NOV2013	11.60	5.50	0.20				
892NOV2014	22.10	10.10	0.20	0.10	0.00	0.00	1
1762OCT2017	8.40	4.78	0.00	1.50	1.03	0.00	2
1581MAY2011	2.60	1.80	0.50	0.10	0.00	0.00	2
1581JAN2013	3.80	1.40	1.70	0.10	0.10	0.00	1
1581DEC2013	14.30	7.90	4.40	0.50	0.40	0.00	2
1581JAN2015	4.30	1.80	3.40	4.20	1.80	4.50	2
1581APR2015	10.10	5.00	7.40	0.20	0.10	0.20	2
1581DEC2015	7.00	3.30	2.30	0.40	0.30	0.00	
1581NOV2016	23.20	5.50	27.90	0.40	0.19	0.00	
1618DEC2011	1.00	0.30	1.10	0.10	0.10	0.00	1
1618JAN2014	4.00	2.10	5.00	0.20	0.10	0.00	2
1618FEB2016							
1618MAR2016	3.10	1.50	2.20	0.50	0.30	0.10	2

1618MAR2018	1.13	0.47	0.69	0.16	0.03	0.01	1
1580OCT2014	4.30	1.40	1.30	0.20	0.10	0.00	1
1691OCT2011	13.70	8.20	2.00	2.50	1.60	0.00	2
1691APR2012	4.00	1.80	1.50	2.60	1.10	0.00	2
1691SEP2013	12.70	4.50	2.70	4.40	2.80	0.10	1
1691JAN2014	10.20	6.40	0.60	4.80	2.50	0.00	2
1691JUN2015							
1691JUL2015	24.50	13.30	1.50	9.80	5.60	0.50	
1691NOV2015	5.50	2.60	1.00	2.30	1.10	0.00	
144SEP2011	7.70	2.60	7.80	0.50	0.10	4.80	1
144MAY2012	1.10	0.60	0.10	0.50	0.20	0.00	2
144MAR2013	1.00	0.30	4.10	0.20	0.00	0.10	1
144NOV2013	15.30	6.60	1.80	7.00	3.50	0.00	1
144FEB2014	4.50	2.70	1.50	1.10	0.70	0.00	2
144APR2015	7.60	1.60	4.00	3.00	0.80	1.30	1
144NOV2017	4.61	2.47	0.49	0.22	0.13	0.00	2
100MAY2011	2.80	1.00	3.80	0.40	0.10	0.00	2
100MAR2015	15.80	6.20	5.40	0.10	0.10	0.00	2
100JUN2016							
100NOV2016	7.50	2.20	5.10	0.20	0.13	0.00	2
1896OCT2011	9.10	4.60	1.00	2.30	1.10	0.00	
1896MAY2015	23.30	9.50	6.20	1.80	1.10	0.10	
884JAN2014	7.30	1.50	2.00	0.10	0.10	0.00	1
884MAR2015	4.70	1.30	5.20	0.10	0.00	0.00	1
1338NOV2017	2.58	1.26	0.24	0.07	0.05	0.02	2
1238NOV2012	2.60	1.20	2.20	0.60	0.30	1.50	2
1238APR2013	3.40	1.30	0.80	1.70	1.00	0.20	2
1238FEB2014	0.60	0.10	1.20	0.00	0.00	0.00	1
1238NOV2014	4.20	2.20	0.50	1.20	0.60	0.00	
1351JUL2011	5.00	2.20	8.80	0.10	0.00	0.00	2
1351SEP2014	4.60	2.80	1.10	0.20	0.10	0.10	2
1351NOV2015	9.10	3.90	5.60	0.30	0.20	0.00	1
1351MAY2016	5.80	2.30	2.20	0.70	0.30	0.10	2
869MAR2013	1.10	0.50	0.50	0.10	0.10	0.00	2
869FEB2017	0.51	0.18	0.00	0.04	0.01	0.00	1
467NOV2011	4.80	1.90	7.00	0.20	0.10	0.00	2
467FEB2014	6.50	3.60	10.50	0.00	0.00	0.00	1
467FEB2015	14.80	8.20	2.70	0.20	0.10	0.00	2
467FEB2016	4.00	1.70	24.00	0.30	0.10	0.20	1
467FEB2017	9.70	6.85	13.40	0.73	0.40	0.00	2
467MAR2018	2.56	1.33	11.08	0.65	0.15	0.00	1
1507MAY2013	1.50	0.60	9.60	0.00	0.00	0.00	1
1507AUG2013	0.60	0.10	25.10	0.40	0.20	0.10	1

1507MAY2014	4.20	1.90	1.70	1.60	0.80	0.60	2
1507SEP2015	13.80	5.60	0.60	0.50	0.30	0.00	1
1507APR2016							
1507MAY2016	3.30	1.90	0.10	1.10	0.30	0.10	2
1507JUN2017	4.92	0.51	0.80	0.68	0.31	0.00	1
1507SEP2017	8.96	3.82	5.50	5.43	3.12	0.00	
1237SEP2011	7.30	3.20	1.80	0.70	0.40	3.70	1
1237MAR2012	2.00	0.70	5.80	0.20	0.10	0.00	2
1237FEB2013	3.10	0.90	1.70	0.50	0.20	0.00	2
1237NOV2013	22.50	10.90	1.30	5.80	3.90	0.00	2
1237FEB2014	8.60	5.70	0.00	1.20	1.00	0.00	2
1237APR2015	12.30	1.40	4.00	2.70	1.40	0.20	1
1237NOV2017	4.89	2.09	0.11	0.10	0.06	0.00	2
1849SEP2014	2.10	1.50	0.00	0.20	0.10	0.00	1
1849FEB2015							
1849MAR2015	0.70	0.40	0.00	0.60	0.40	0.00	2
1700JAN2013	1.70	1.00	0.10	1.30	0.80	0.00	2
1700SEP2014	5.20	2.50	0.10	1.20	0.60	0.00	1
1700FEB2015							
1700MAR2015	1.00	0.50	0.00	0.60	0.20	0.10	2
1700FEB2018							
1700MAR2018	5.62	3.08	0.00	2.47	1.53	0.07	2
543AUG2011	3.60	1.30	1.60	0.10	0.00	0.10	1
543JUL2013	1.40	0.40	0.30	0.10	0.00	0.90	1
543JUL2015	5.20	2.80	0.10	1.00	0.50	0.00	1
543DEC2015	2.30	1.50	0.10	0.30	0.20	0.00	2
543MAY2017	1.77	0.62	0.18	0.55	0.17	0.00	1
543SEP2017	2.07	1.13	0.45	1.14	0.72	0.00	1
1825FEB2017	6.00	1.32	0.00	0.48	0.20	0.00	2
78JAN2013	4.40	2.70	1.50	0.40	0.20	0.00	2
78JAN2015	11.20	5.70	1.50	0.20	0.10	0.00	2
78DEC2016	4.10	1.30	0.30	0.27	0.18	0.00	2
6668SEP2015	6.20	3.10	0.40	0.10	0.10	0.00	1
6668FEB2016	3.60	3.10	4.70	0.50	0.30	0.10	1
141MAY2015	3.80	1.60	1.50	0.20	0.00	0.00	1
141FEB2016	0.90	0.30	0.60	0.00	0.00	0.00	
1145JAN2013							
1145JAN2014							
1145NOV2014							
1145APR2015							
1145JAN2016							
1145FEB2016							
1145FEB2017							
1145DEC2017							
1145DEC2017							
526JUN2011	1.00	0.70	0.40	0.00	0.00	0.20	2

526JUL2013	1.70	0.80	0.20	0.10	0.10	0.30	2
526MAY2015	1.80	0.90	0.00	0.10	0.00	0.00	2
526MAY2017							
526JUN2017	1.26	0.32	0.03	0.26	0.16	0.37	1
526SEP2017	0.30	0.12	0.18	0.08	0.06	0.01	1
1198NOV2011	3.20	1.20	0.90				1
1198OCT2012	8.40	5.20	0.70	0.10	0.10	0.10	2
304MAR2013	1.30	0.90	0.80	0.10	0.10	0.00	2
304JAN2017							
304JAN2017	2.11	1.04	0.01	0.06	0.04	0.00	2
314OCT2011	4.20	2.20	0.20	0.20	0.20	0.00	2
314MAY2013	0.80	0.20	0.20	0.00	0.00	0.00	1
314SEP2013	2.80	0.10	1.00	0.00	0.00	0.00	1
314OCT2015	17.60	9.80	0.00	1.50	1.00	0.00	2
314FEB2016	1.10	0.40	0.10	0.60	0.40	0.00	2
314JUN2017	4.92	1.38	0.00	0.30	0.15	0.04	1
314SEP2017							
314OCT2017	2.37	1.47	0.00	3.86	2.32	0.01	2
332SEP2015	5.10	2.40	0.20	1.30	1.10	0.00	2
332APR2017	2.82	1.43	0.07	0.38	0.25	0.01	2
332MAR2018	0.88	0.47	0.32	0.35	0.05	0.02	2
527AUG2011	5.00	2.50	11.80	0.60	0.20	0.20	1
527MAR2012	2.80	1.30	0.50	0.20	0.10	0.00	2
527MAY2013	4.70	1.80	4.30	0.50	0.10	0.20	2
527AUG2013	0.80	0.10	7.70	0.00	0.00	0.00	2
527MAY2015	1.90	1.00	0.20	0.40	0.20	0.10	2
527JUL2016	4.50	1.80	1.00	0.60	0.20	0.30	1
527JUN2017	3.93	0.54	2.78	1.74	0.62	0.76	1
527SEP2017	3.34	1.58	3.28	1.07	0.72	0.00	1
1059JAN2012	0.20	0.00	0.10	0.00	0.00	0.00	1
1059JAN2014	2.50		1.70	0.00	0.00	0.00	2
1059FEB2016							
1059MAR2016	1.80	0.70	0.70	0.10	0.10	0.00	2
1059MAR2018	0.50	0.19	0.42	0.48	0.22	0.18	2
1895FEB2013	22.40	13.10	4.10	8.70	4.70	0.00	2
1895MAY2013	8.30	5.70	0.00	2.80	1.90	0.00	2
1895OCT2013							
1895NOV2013	22.00	14.70	0.10	12.80	8.60	0.00	2
1895OCT2014	2.60	1.20	0.00	1.10	0.60	0.00	2
1895JUN2016	0.40	0.10	0.30	1.60	1.00	0.00	1
1895JUN2017	3.79	1.99	0.18	0.70	0.49	0.00	2
1350NOV2011	4.60	2.30	1.00	0.40	0.30	0.00	2
1350DEC2013	2.60	1.30	0.40	0.20	0.10	0.00	1

1350MAR2016	2.00	0.80	0.20	0.00	0.00	0.00	1
831DEC2011	4.70	1.60	1.70	0.00	0.00	0.00	1
831NOV2012	4.10	2.90	0.40	0.10	0.00	0.10	2
831OCT2014	6.90	2.30	0.70	0.00	0.00	0.00	1
831MAR2017	2.71	1.33	0.45	0.23	0.11	0.01	2
728MAR2013	0.90	0.40	0.20	0.20	0.20	0.00	2
728MAR2015	4.40	2.20	0.60	0.10	0.10	0.00	2
728FEB2017	1.85	1.15	0.40	0.27	0.13	0.03	2
746SEP2015	7.50	2.20	0.20	0.70	0.60	0.00	2
746MAR2018	0.88	0.30	0.10	0.20	0.03	0.00	2
211MAR2011	2.50	0.40	2.80	0.10	0.10	0.20	1
211AUG2011	2.20	0.50	18.10	0.60	0.10	0.60	2
211MAY2012	4.40	1.80	1.20	0.60	0.40	1.30	2
211JAN2013	6.90	4.10	0.90	0.60	0.40	0.00	2
211FEB2014	0.30	0.20	0.20	0.00	0.00	0.00	1
211AUG2014	2.90	1.00	8.50	0.30	0.20	0.00	1
211JAN2015	3.60	1.90	2.80	0.50	0.20	0.40	2
211OCT2015	0.60	0.10	2.30	0.10	0.00	0.20	1
211APR2016	4.00	1.40	4.70	0.30	0.20	0.00	2
211NOV2017	7.33	2.62	5.79	0.17	0.05	0.00	1
380MAY2012	4.20	2.10	1.80	0.30	0.10	0.30	2
380JUN2014	5.10	2.20	6.00	0.00	0.00	0.50	2
380FEB2015	11.60	4.20	2.70	1.80	0.80	0.10	2
380DEC2015	11.30	4.80	2.00	0.20	0.00	0.00	2
380DEC2016	25.30	10.30	2.10	0.62	0.26	0.02	2
1079AUG2014	2.30	0.10	1.90	0.50	0.20	0.00	1
1079DEC2014	0.40	0.30	0.00	0.10	0.00	0.00	2
1079SEP2016	14.50	7.20	0.10	13.60	9.70	0.00	2
465JAN2013	2.70	2.00	4.30	0.00	0.00	0.00	1
465NOV2013	12.00	10.30	3.00	0.00	0.00	0.00	2
465FEB2015	6.90	3.20	6.10	0.20	0.10	0.40	2
465JAN2017	2.87	1.63	2.53	0.15	0.04	0.05	1
221SEP2015	14.10	9.90	0.10	1.20	1.10	0.70	2
221MAR2018	2.15	1.10	0.59	0.87	0.24	0.03	2
306SEP2011	1.30	0.40	1.10	0.30	0.10	0.00	1
306MAR2012	1.20	0.50	0.40	0.10	0.10	0.00	1
306AUG2013	0.10	0.00	0.00	0.20	0.10	0.00	1
306FEB2014	3.60	1.50	0.50	0.70	0.50	0.00	1
306JUL2014	0.60	0.40	0.20	0.00	0.00	0.00	2
306SEP2015	3.30	1.40	0.20	0.00	0.00	0.00	1
306MAR2016							
306APR2016	2.40	1.40	0.30	0.90	0.50	0.00	2
306NOV2017	4.38	1.67	1.06	0.49	0.27	0.00	1
1839FEB2017	2.65	0.75	0.00	0.15	0.03	0.05	1
7054DEC2017	1.78	0.91	0.29	0.02	0.00	0.00	1
1472AUG2011	2.40	1.30	0.30	0.00	0.00	0.00	1
1472MAY2016	5.30	4.20	0.10	0.40	0.20	0.20	1

1472FEB2017	1.86	1.08	0.01	0.65	0.32	0.00	2
820NOV2014	13.50	5.60	2.40	0.00	0.00	0.00	1
820JUL2015	6.20	3.40	2.00	0.10	0.00	0.00	2
820JAN2017	3.10	1.50	0.30	0.28	0.14	0.01	1
820OCT2017	5.48	3.09	2.91	0.57	0.37	0.03	2
1705DEC2011	1.10	0.20	0.00	0.30	0.20	0.00	1
1705AUG2015	8.70	3.90	0.00	0.60	0.40	0.00	1
1705APR2016	1.70	1.10	0.00	1.30	0.90	0.00	2

% MOTILE decline	Potenital Resistance?	Comments
86%	No	
41%	Yes	
62%	No	Messmer et al. give 79% efficacy; all zone (excluding 3.5) efficacy 90% in 2012; EC50 for Quatsino 120 ppb in 2011 higher than EC50 for the other zones (except 3.5)
78%	No	
85%	No	
100%	No	
97%	No	
100%	No	
82%	No	
89%	No	
90%	No	post-treatment counts 3 months post
86%	No	
71%	No	
97%	No	
#DIV/0!	#DIV/0!	
94%	No	
84%	No	
36%	Yes	
94%	No	
#DIV/0!	#DIV/0!	
92%	No	
94%	No	
100%	No	
#DIV/0!	#DIV/0!	
80%	No	
99%	No	
94%	No	
98%	No	
97%	No	
100%	No	
99%	No	
65%	No	
90%	No	
-30%	Yes	
94%	No	
97%	No	
89%	No	
90%	No	
70%	No	

91%	No	
100%	No	
67%	No	
78%	No	
89%	No	
58%	Yes	
96%	No	
96%	No	
80%	No	
97%	No	
#DIV/0!	#DIV/0!	
77%	No	
99%	No	
81%	No	
98%	No	
87%	No	
95%	No	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
100%	No	
96%	No	
45%	Yes	Abundance in 3rd month post treatment was .4
85%	No	
20%	Yes	2ND TREATMENT WITHOUT RECRUITMENT
56%	Yes	
73%	No	
100%	No	
97%	No	
94%	No	
83%	No	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
97%	No	
#VALUE!	#VALUE!	counts not performed for several months after due to IHN outbreak
92%	No	
100%	No	
87%	No	
76%	No	
#DIV/0!	#DIV/0!	
22%	Yes	
100%	No	
94%	No	
88%	No	
80%	No	
93%	No	
100%	No	
#DIV/0!	#DIV/0!	Only fed one day, treatment stopped due to bloom

96%	No	
85%	No	
78%	No	
100%	No	
#DIV/0!	#DIV/0!	
87%	No	
75%	No	
100%	No	
-124%	Yes	pre-treatment count likely higher - used July count because no counts submitted during summer due to plankton concerns; No treatment effect; extremely high EC50 (Nov 2016)
93%	No	
46%	Yes	
97%	No	
83%	No	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
83%	No	
100%	No	
95%	No	
100%	No	
#DIV/0!	#DIV/0!	Not a true treatment?
84%	No	post-treatment counts 1 month after since April data not yet available
94%	No	post-treatment counts 1 month after since no counts performed 2 months after
38%	Yes	
-23%	Yes	reduced efficacy; Jan2013 substantial increase in EC50. Messmer et al. gives 5% efficacy for the Oct 2012 treatment
96%	No	
56%	Yes	
12%	Yes	
90%	No	
100%	No	Fish were transferred - post-count not performed at this facility
100%	No	
82%	No	
96%	No	
97%	No	
97%	No	
2%	Yes	Not a true treatment?
98%	No	
94%	No	
98%	No	
90%	No	
95%	No	
#DIV/0!	#DIV/0!	
84%	No	

96%	No	
85%	No	
78%	No	
100%	No	
#DIV/0!	#DIV/0!	
87%	No	
75%	No	
100%	No	
-124%	Yes	pre-treatment count likely higher - used July count because no counts submitted during summer due to plankton concerns; No treatment effect; extremely high EC50 (Nov 2016)
93%	No	
46%	Yes	
97%	No	
83%	No	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
83%	No	
100%	No	
95%	No	
100%	No	
#DIV/0!	#DIV/0!	Not a true treatment?
84%	No	post-treatment counts 1 month after since April data not yet available
94%	No	post-treatment counts 1 month after since no counts performed 2 months after
38%	Yes	
-23%	Yes	reduced efficacy; Jan2013 substantial increase in EC50. Messmer et al. gives 5% efficacy for the Oct 2012 treatment
96%	No	
56%	Yes	
12%	Yes	
90%	No	
100%	No	Fish were transferred - post-count not performed at this facility
100%	No	
82%	No	
96%	No	
97%	No	
97%	No	
2%	Yes	Not a true treatment?
98%	No	
94%	No	
98%	No	
90%	No	
95%	No	
#DIV/0!	#DIV/0!	
84%	No	

86%	No	post-treatment count 1 month after treatment
95%	No	
82%	No	
35%	No	post-treatment abundance 1 month post treatment as no sampling 2 months pos
65%	No	lice numbers went up very quickly, were reduced by 65% but no residual
53%	Yes	reduced efficacy; no bioassay data on file; KRISTA: The next month was significantly lower
#DIV/0!	#DIV/0!	
60%	No	reduced efficacy; no bioassay data on file
58%	Yes	
94%	No	
55%	Yes	
80%	No	
54%	No	
76%	No	Reduced efficacy interpreted as increased tolerance; no bioassay data on file
61%	No	
95%	No	
86%	No	
99%	No	
#DIV/0!	#DIV/0!	Not a true treatment?
97%	No	
75%	No	
92%	No	While abundances dropped, there was no residual, and lice count skyrocketed in
99%	No	
98%	No	Lice numbers went back up again very quickly
97%	No	
77%	No	Lice numbers went back up again very quickly
50%	Yes	
100%	No	
		Lice numbers went back up again very quickly; IAN:
71%	No	Reduced efficacy interpreted as increased tolerance; no bioassay data on file
98%	No	
96%	No	
97%	No	
88%	No	
91%	No	
93%	No	
96%	No	
100%	No	
99%	No	
93%	No	
93%	No	post counts 3 months after
75%	No	post counts 1 month after
100%	No	
33%	Yes	low motile counts but chalimus were greatly reduced

62%	No	
96%	No	
#DIV/0!	#DIV/0!	
67%	No	
86%	No	lice counts went up very quickly after
39%	Yes	
90%	No	
90%	No	
84%	No	
74%	No	
86%	No	Reduced efficacy interpreted as increased tolerance; no bioassay data on file
78%	No	another exceedance in spring 2016, fish were harvested
98%	No	
90%	No	
#DIV/0!	#DIV/0!	
14%	Yes	previous treatment done at low abundance and difficult to tell whether it was suc
24%	Yes	counts dropped in 3rd month post treatment
77%	No	
#DIV/0!	#DIV/0!	
40%	Yes	
#DIV/0!	#DIV/0!	
56%	Yes	post treatment counts only 1 month after
97%	No	
93%	No	
81%	No	
87%	No	
69%	No	
45%	Yes	
92%	No	
91%	No	
98%	No	
93%	No	
98%	No	
86%	No	
95%	No	
100%	No	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
#DIV/0!	#DIV/0!	
100%	No	

94%	No	
94%	No	
#DIV/0!	#DIV/0!	
79%	No	post treatment counts 3 months after
74%	No	
100%	No	Fish were transferred - post-count not performed at this facility
99%	No	
92%	No	
#DIV/0!	#DIV/0!	
97%	No	
95%	No	
100%	No	
100%	No	
91%	No	
45%	Yes	
94%	No	
#DIV/0!	#DIV/0!	
-63%	Yes	
75%	No	post treatment counts 3 months after
86%	No	
60%	No	post treatment counts 1 month after
88%	No	
93%	No	
89%	No	
100%	No	
79%	No	
87%	No	
56%	Yes	
68%	No	
100%	No	
100%	No	
#DIV/0!	#DIV/0!	
94%	No	
4%	Yes	post treatment counts 1 month after
		Redcued efficacy; pre-treatment EC50 is not at a concerning level i.e. ~100 ppb; Messmer et al. give 60% efficacy for the 'last' treatment - this treatment was prior to January 2011
61%	No	
		failed treatment; May 2013 moderate increase in EC50 pre-treatment
66%	No	
#DIV/0!	#DIV/0!	
42%	Yes	
58%	Yes	
-300%	Yes	
82%	No	
91%	No	
92%	No	

100%	No	
100%	No	
98%	No	
100%	No	
92%	No	
78%	No	
98%	No	
86%	No	
91%	No	post treatment counts 3 months after
77%	No	post treatment counts 1 month after
96%	No	
73%	No	INTERNAL AMPLIFICATION
86%	No	post treatment counts 3 months after
91%	No	
100%	No	
90%	No	
86%	No	
83%	No	
93%	No	
98%	No	
93%	No	post treatment counts 3 months after
100%	No	post treatment counts 3 months after
84%	No	post treatment counts 1 month after
98%	No	
98%	No	
78%	No	
75%	No	
6%		No treatment effect; extremely high EC50 (Nov 2016)
100%	No	
100%	No	
97%	No	
95%	No	
91%	No	
59%		post treatment counts 1 month after
77%	No	
92%	No	
100%		Not sure if this treatment is correct?
81%	No	
100%	No	
100%	No	
#DIV/0!	#DIV/0!	
63%	No	
89%	No	
94%	No	
99%	No	
100%	No	
92%	No	

65%	No
100%	No
98%	No
91%	No
90%	No
73%	No
93%	No
24%	No

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it

months following.

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ccessful, or when treatment actually occurred

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Maley, Shelley

From: Waddington, Zac
Sent: November-19-18 10:30 AM
To: Webb, Allison
Cc: McConnachie, Sarah; McCorquodale, Brenda
Subject: Phone message
Attachments: Cantrell, et al., 2018. Farm Connectivity with particle tracking.pdf

Sorry I missed your call, I was chatting with the ATIP folks about this sea lice ATIP. Thanks very much for the info on this area-based management initiative, and I/we will wait and see what Allister says regarding any comparative work that NHQ has done looking at area-based management in other jurisdictions. Sarah did have a good chat with Brenda last week about how she might get involved with this initiative but there was no concrete plan made to my knowledge.

Our hope is that we can inject some fish health perspective into the "Bay Area" level of the nested approach to area-based management as proposed in the DECK sent around next week. This area-based approach is very timely and has been used with great success in many jurisdictions around the world, and within BC, to improve fish health outcomes. Interestingly, a recent article was just published which looked at farm-to-farm transmission of sea lice in the Broughton using the FVCOM model and another particle tracking model. I've attached it FYI. I think that developing areas based on sea lice transmission between farms is an excellent idea given the measureable effects of sea lice, and the recent and emerging issues surrounding SLICE resistance.

Thanks again for your input,

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)
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Available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6218437/>



The Use of Kernel Density Estimation With a Bio-Physical Model Provides a Method to Quantify Connectivity Among Salmon Farms: Spatial Planning and Management With Epidemiological Relevance

OPEN ACCESS

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Connectivity Among Salmon Farms:
Spatial Planning and Management
With Epidemiological Relevance.
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Connectivity in an aquatic setting is determined by a combination of hydrodynamic circulation and the biology of the organisms driving linkages. These complex processes can be simulated in coupled biological-physical models. The physical model refers to an underlying circulation model defined by spatially-explicit nodes, often incorporating a particle-tracking model. The particles can then be given biological parameters or behaviors (such as maturity and/or survivability rates, diel vertical migrations, avoidance, or seeking behaviors). The output of the bio-physical models can then be used to quantify connectivity among the nodes emitting and/or receiving the particles. Here we propose a method that makes use of kernel density estimation (KDE) on the output of a particle-tracking model, to quantify the infection or infestation pressure (IP) that each node causes on the surrounding area. Because IP is the product of both exposure time and the concentration of infectious agent particles, using KDE (which also combine elements of time and space), more accurately captures IP. This method is especially useful for those interested in infectious agent networks, a situation where IP is a superior measure of connectivity than the probability of particles from each node reaching other nodes. Here we illustrate the method by modeling the connectivity of salmon farms via sea lice larvae in the Broughton Archipelago, British Columbia, Canada. Analysis revealed evidence of two sub-networks of farms connected via a single farm, and evidence that the highest IP from a given emitting farm was often tens of kilometers or more away from that farm. We also classified farms as net emitters, receivers, or balanced, based on their structural role within the network. By better understanding how these salmon farms are connected to each other via their sea lice larvae, we can effectively focus management efforts to minimize the spread of sea lice between farms, advise on future site locations

Pages 71 to / à 83
are withheld pursuant to section
sont retenues en vertu de l'article

68(a)

of the Access to Information Act
de la Loi sur l'accès à l'information

Maley, Shelley

From: Waddington, Zac
Sent: November-21-18 10:43 AM
To: Webb, Allison
Cc: McConnachie, Sarah
Subject: RE: DFO recommendations - MOE IPM regulation amendments

Sorry to bug you again, but I was curious if you had a chance to chat with Alistair about the area-based management initiative and what work NHQ had done, and how we (specifically Sarah), might be able to contribute to the ecosystem area "layer" or "nest" within the broader area-based management plan.

Zac

From: Webb, Allison
Sent: November-20-18 6:24 PM
To: Paylor, Adrienne
Cc: Taekema, Bernie John; Waddington, Zac; McCorquodale, Brenda
Subject: RE: DFO recommendations - MOE IPM regulation amendments

Thanks so much for putting this together. I'll review and get this to Andy by Fri. Also sending to NHQ as Alistair requested that Ed Porter review as well.

Appreciate your help,
Allison

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Paylor, Adrienne
Sent: Tuesday, November 20, 2018 2:26 PM
To: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>
Cc: Taekema, Bernie John <BernieJohn.Taekema@dfo-mpo.gc.ca>; Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>; McCorquodale, Brenda <Brenda.McCorquodale@dfo-mpo.gc.ca>
Subject: FW: DFO recommendations - MOE IPM regulation amendments

Allison below are the recommendations that Bernie, Zac and I are recommending following our review and discussions with MOE. I have also attached the actual regulatory proposal in case you need it. Let us know if you need more explanation or background on any of this.

Thank you,
Adrienne

From: Taekema, Bernie John
Sent: November-20-18 10:07 AM
To: Paylor, Adrienne

Cc: Waddington, Zac; McCorquodale, Brenda
Subject: DFO recommendations - MOE IPM regulation amendments

Hi Adrienne,

The following is our recommendations to Allison and Andy related to MOE's proposed amendments to their Integrated Pest Management Regulation. Please review and let me/Zac know if you need further information.

Amendment #1: DFO has no concerns about the requirement that industry needs a pesticide use permit in order to use pesticides to control sea lice.

Amendment #2 Part 1 (requirement to use a well boat): Recommended alternate wording is "Best Available Technology to be used which limit the deposition of pesticides into the environment". Should not specifically state well boats as depending on location different methods may be used/required which do not alter the amount of pesticide being deposited into the environment.

Amendment #2 Part 2 (substitution other "closed containment" application technology). As above, DFO recommends using best available technology rather than prescribing "other closed containment" as to focus more on the desired environmental outcomes rather than prescribing treatment techniques. This amendment may be redundant if the wording and scope of Part 1 is changed as suggested.

Amendment #3 (exemption in case of emergencies: Change focus to managing sea lice rather than protecting wild salmon. Condition could include industry requiring support from DFO when applying for emergency measures. This is currently the process used when an Emergency Drug Release request is made to the Veterinary Drugs Directorate of Health Canada.

Amendment #4 (one year implementation): Industry input of primary importance as this may take more time to develop and implement. (DFO could support industry if necessary.)

In addition we recommend that hydrogen peroxide be exempted from requiring a PUP and be added to Schedule 2 of the IMP regulation. (DFO is the only jurisdiction in Canada and possible the world that requires a licence to be held to use hydrogen peroxide.) The background for this recommendation is as follows:

There are significant challenges surrounding consultation over peroxide use required to attain a PUP from MoE (especially in certain regions), to the extent that attaining a PUP for many farms/regions is virtually impossible. Industry has made investments in alternate treatment modalities (eg. Hydrolicer), but logistical realities limit the scope of their use in time and space. This has contributed to the recent request to use an in-feed chitin synthesis inhibitor drug called Imvixa at a number of farms in the Broughton and Discovery Islands. This drug has previously been used for smolts being restocked into the Clayoquot region in the fall of 2018 to provide them with 6-9 months of sea lice resistance. This drug is only fed in hatchery, and has an excellent safety and environmental review and has been vetted by the Veterinary Drugs Directorate of Health Canada. However, this highlights the challenges that arise due to the arduous consultative process over a pesticide with such benign environmental properties.

Bernie Taekema
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Nanaimo BC V9S 5W8
phone: 250 754-0398
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s.16(2)(c)

Maley, Shelley

From: Waddington, Zac
Sent: November-21-18 1:27 PM
To: Diamond, Maria
Cc: Sandberg, Krista
Subject: Clayoquot data
Attachments: Calendar of events concerning Clayoquot.docx; Chronology of Clayoquot Lice on Farms.docx

Could you please take a peek at this summary document titled "Chronology of Clayoquot Lice on Farms" [REDACTED] [REDACTED] I would like to add detail on when (and if) we received a notification of sea lice over abundance from Cermaq. Krista and I were looking through the AQFF inbox and found at least one where it wasn't in the compliance tracking, so can you please check the inbox as well to ensure that we haven't missed any.

I've also included another document that I prepared titled "Calendar of events...." which you can refer to if that helps.

Thanks heaps!

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)
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s.21(1)(a)
s.21(1)(b)

Chronology of Clayoquot Lice on Farms

Prior to March 1st, 2018 there were 4 farms with >3 motiles/fish: Millar Channel, Ross Pass, Dixon Bay and Bawden.

During the outmigration period (March 1-June 30, 2018), another 7 sites exceeded including: Saranac (exceeded March 19th, 2018), Mussel Rock (exceeded April 16th, 2018), Rant Point (exceeded April 16th, 2018), Bare Bluff (exceeded May 29th, 2018), Bedwell (exceeded May 28th, 2018), Fortune Channel (exceeded May 28th, 2018), Plover Point (exceeded May 29th, 2018).

Bawden:

- Exceeded December 20th, 2017.
- No counts reported in Feb. 2018 due to recent SLICE treatment from Feb.1-7
- First reported count on March 6th, 2018 post-SLICE treatment exceeded (7.98 motile avg.)
 - No SLICE efficacy
- Absolute sea lice inventory increased steadily throughout out migration until the very end of June
 - Peroxide treatment performed June 11-24th, 2018
 - Pre-treatment counts of ~51 motiles/fish; Post-treatment counts still in exceedance (~5.7 motiles/fish); however absolute sea lice inventory did decrease in the last weeks of the outmigration
- DFO Fish Health staff conducted independent bioassay on May 31st, 2018 which subsequently confirmed SLICE resistance

- [REDACTED]

Millar Channel:

- Exceeded first August 20th, 2018
- Treated with SLICE beginning September 21st, 2018
- Next reported counts (performed Oct. 17, 18 and 20th, 2017) were still in exceedance
 - Greatly reduced SLICE efficacy
- Harvested out in April 2018
- Absolute sea lice inventory rose throughout March, 2018

- [REDACTED]

s.21(1)(a)

s.21(1)(b)

Ross Pass

- Exceeded Sept. 20th, 2017
- SLICE treatment performed Oct 1-7th, 2018
- First reported count post-treatment (performed Oct. 19-20, 2017) exceeded
 - Greatly reduced SLICE efficacy
- Harvested out in April 2018
- Absolute sea lice inventory decreased from March to April

Calendar of events concerning Clayoquot

- 22 August, Saranac notification with biweekly count as management plan
- 5 August, Fortune notification – no management plan written but bi-weekly counts, as Saranac
- 13 October 2017 submitted Appendix VI-A (sea lice counts for September)
 - Saranac: Reported September 16-23 area based treatment
 - Mussel: no notification necessary; abundance <3. Treated prior to submission of a plan but performed bioassay prior to area based treatment.
 - Millar: Submitted notification (Section 6.5) more than 30 days after 1st discovery (5 September) and area based treatment occurred prior to submission of a plan and without performing a pre-treatment bioassay. These fish were treated in June, with effect but with lower drug tissue levels than target. Now the same lice population was being treated with the same drug within 3 months, something that the regulator would not have agreed with. (Since the plan was not submitted and DFO is speaking retrospectively. But in BC, there is reliance on lice from wild fish 'diluting' the resistance genes before the lice population is treated again with the same drug. DFO vet has confidence that veterinary peers would agree with this opinion.)
 - Ross: Misreported. This report was submitted less than 30 days after 1st discovery, 20 September (Section 6.5). The report said there was "no action required." What is not clear is whether, given that the regulator may have accepted their bi-weekly counts as an accepted management action had this been in a submitted plan, with treatment after recruitment of lice from wild fish that predictably dilute the resistance genes in the lice on the farmed fish.
- 10 November 2017 submitted October sea lice counts
 - Ross: Submitted notification (Section 6.5) more than 30 days after 1st discovery (20 September) and area based treatment occurred prior to submission of a plan and without performing a pre-treatment bioassay. These fish were treated in June, with effect but with lower drug tissue levels than target. Now the same lice population was being treated with the same drug within 3 months, something that the regulator would not have agreed with. (Since the plan was not submitted and DFO is speaking retrospectively. But in BC, there is reliance on lice from wild fish 'diluting' the resistance genes before the lice population is treated again with the same drug. DFO vet has confidence that veterinary peers would agree with this opinion.)
 - Reported October 1 initiation of treatment – had not submitted notification of exceedance or area based treatment
 - Dixon: Reported October 5 initiation of treatment – technically fulfilled COL notification of exceedance 17 September in October report
 - Brent: Notification and management included in October report i.e. 5 November initiation of area based management
 - Venture: Notification and management plan included in October report i.e. 4 November initiation of area based management
- 22 November 2017, site visit to Ross

- No strict licence condition violation (i.e. plan (harvest) did reduce absolute sea lice inventory within the outmigration period, despite entering outmigration in exceedance)

Dixon Bay

- Exceeded Sept. 17th, 2018
- SLICE treatment performed beginning Oct. 5th, 2018
- November 2017 counts exceeded
 - Greatly reduced SLICE efficacy
- Harvested out in June, 2018
- Absolute sea lice inventory increased throughout March and April 2018; declined very slightly in May
- [REDACTED]

Saranac

- Exceeded March 19th, 2018
- Harvested out in July, 2018
- Absolute sea lice inventory increased throughout outmigration (confirm June)
- [REDACTED]

Mussel Rock

- Exceeded April 16th, 2018
- Absolute sea lice inventory increased throughout outmigration (confirm June)
- [REDACTED]

Rant Point

- Exceeded April 16th, 2018
- Absolute sea lice inventory increased throughout outmigration
- [REDACTED]

Bare Bluff

- Exceeded May 29, 2018
- Peroxide treatment performed June 24-30, 2018
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~26 days after exceedance.
- SLICE treatment performed Aug 15-21, 2018

Bedwell Sound

- Exceeded May 28th, 2018

s.21(1)(a)

s.21(1)(b)

- Peroxide treatment performed July 2-7, 2018 (outside outmigration window)
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~35 days after exceedance

Fortune Channel

- Exceeded May 28th, 2018
- Peroxide treatment performed beginning July 8, 2018 (outside outmigration window)
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~41 days after exceedance
- Various management, sea lice and fish health concerns lead to site being culled beginning August 30th, 2018

Plover Point

- Exceeded May 29th, 2018
- Peroxide treatment performed June 7-10, 2018
- Met CoL in that a plan was implemented within 15 days of exceedance which reduced absolute sea lice inventory
- SLICE treatment performed beginning Aug 25th, 2018

Maley, Shelley

From: Waddington, Zac
Sent: November-21-18 1:39 PM
To: Diamond, Maria
Cc: Sandberg, Krista
Subject: RE: Clayoquot data
Attachments: Chronology of Clayoquot Lice on Farms.docx

Please use this version. Krista just updated the lice data for June 2018, so now we have the whole story over the outmigration.

Zac

From: Waddington, Zac
Sent: November-21-18 1:27 PM
To: Diamond, Maria
Cc: Sandberg, Krista
Subject: Clayoquot data

Could you please take a peek at this summary document titled "Chronology of Clayoquot Lice on Farms" [REDACTED] [REDACTED] I would like to add detail on when (and if) we received a notification of sea lice over abundance from Cermaq. Krista and I were looking through the AQFF inbox and found at least one where it wasn't in the compliance tracking, so can you please check the inbox as well to ensure that we haven't missed any.

I've also included another document that Ian prepared titled "Calendar of events...." which you can refer to if that helps.

Thanks heaps!

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)
Lead Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia
Telephone | Téléphone: 250-703-0902
Fax | Télécopieur: 250-703-0921
Zac.Waddington@dfo-mpo.gc.ca

s.21(1)(a)

s.21(1)(b)

Chronology of Clayoquot Lice on Farms

Prior to March 1st, 2018 there were 4 farms with >3 motiles/fish: Millar Channel, Ross Pass, Dixon Bay and Bawden.

During the outmigration period (March 1-June 30, 2018), another 7 sites exceeded including: Saranac (exceeded March 19th, 2018), Mussel Rock (exceeded April 16th, 2018), Rant Point (exceeded April 16th, 2018), Bare Bluff (exceeded May 29th, 2018), Bedwell (exceeded May 28th, 2018), Fortune Channel (exceeded May 28th, 2018), Plover Point (exceeded May 29th, 2018).

Bawden:

- Exceeded December 20th, 2017.
- No counts reported in Feb. 2018 due to recent SLICE treatment from Feb.1-7
- First reported count on March 6th, 2018 post-SLICE treatment exceeded (7.98 motile avg.)
 - No SLICE efficacy
- Absolute sea lice inventory increased steadily throughout out migration until the very end of June
 - Peroxide treatment performed June 11-24th, 2018
 - Pre-treatment counts of ~51 motiles/fish; Post-treatment counts still in exceedance (~5.7 motiles/fish); however absolute sea lice inventory did decrease in the last weeks of the outmigration
- DFO Fish Health staff conducted independent bioassay on May 31st, 2018 which subsequently confirmed SLICE resistance

- [REDACTED]

Millar Channel:

- Exceeded first August 20th, 2018
- Treated with SLICE beginning September 21st, 2018
- Next reported counts (performed Oct. 17, 18 and 20th, 2017) were still in exceedance
 - Greatly reduced SLICE efficacy
- Harvested out in April 2018
- Absolute sea lice inventory rose throughout March, 2018

- [REDACTED]

Ross Pass

s.21(1)(a)

s.21(1)(b)

- Exceeded Sept. 20th, 2017
- SLICE treatment performed Oct 1-7th, 2018
- First reported count post-treatment (performed Oct. 19-20, 2017) exceeded
 - Greatly reduced SLICE efficacy
- Harvested out in April 2018
- Absolute sea lice inventory decreased from March to April

- No strict licence condition violation (i.e. plan (harvest) did reduce absolute sea lice inventory within the outmigration period, despite entering outmigration in exceedance)

Dixon Bay

- Exceeded Sept. 17th, 2018
- SLICE treatment performed beginning Oct. 5th, 2018
- November 2017 counts exceeded
 - Greatly reduced SLICE efficacy
- Harvested out in June, 2018
- Absolute sea lice inventory increased throughout March and April 2018; declined very slightly in May
- [REDACTED]

Saranac

- Exceeded March 19th, 2018
- Harvested out in July, 2018
- Absolute sea lice inventory increased throughout outmigration with a slight decrease during June 2018
- [REDACTED]

Mussel Rock

- Exceeded April 16th, 2018
- Absolute sea lice inventory increased throughout outmigration
- Harvested out in July, 2018
- [REDACTED]

Rant Point

- Exceeded April 16th, 2018
- Absolute sea lice inventory increased throughout outmigration
- [REDACTED]

Bare Bluff

- Exceeded May 29, 2018
- Peroxide treatment performed June 24-30, 2018
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~26 days after exceedance.
- [REDACTED]
- SLICE treatment performed Aug 16-22, 2018

s.21(1)(a)

s.21(1)(b)

Bedwell Sound

- Exceeded May 28th, 2018
- Peroxide treatment performed July 2-7, 2018 (outside outmigration window)
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~35 days after exceedance
- [REDACTED]
- SLICE treatment performed Aug 18-26, 2018

Fortune Channel

- Exceeded May 28th, 2018
- Peroxide treatment performed beginning July 8, 2018 (outside outmigration window)
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~41 days after exceedance
- [REDACTED]
- SLICE treatment performed Aug 15-21, 2018
- Various management, sea lice and fish health concerns lead to site being culled beginning August 30th, 2018

Plover Point

- Exceeded May 29th, 2018
- Peroxide treatment performed June 7-10, 2018
- Met CoL in that a plan was implemented within 15 days of exceedance which reduced absolute sea lice inventory
- SLICE treatment performed Aug 18-25, 2018

s.21(1)(a)
s.21(1)(b)

Maley, Shelley

From: Waddington, Zac
Sent: November-22-18 10:59 AM
To: Diamond, Maria
Subject: RE: Attached
Attachments: Chronology of Clayoquot Lice on Farms.docx

See the attached as we discussed. All the AQFF inbox notifications and discussion for any of the 11 sites which exceeded during the 2018 outmigration should be printed off and given to Dan T. For the purposes of this summary document, we just need to determine whether they met the licence conditions of reporting the exceedance, and providing a plan for each of the farms. And what dates those emails were received. Ian's Calendar of events.... Attachement I sent yesterday may have some useful detail.....or not.

Thanks a bunch,

Zac

From: Diamond, Maria
Sent: November-22-18 9:47 AM
To: Waddington, Zac
Subject: Attached

Hey Zac,

Tried calling you back I'm at Byron's desk. Have a look through the attached with my comments/inserts and let's discuss.

Maria

Maria Diamond, B.Sc.

Aquatic Science Biologist / Biologiste en sciences aquatiques
Aquaculture Management Division / Gestion de l'aquaculture
Aquaculture Environmental Operations/Opérations environnementales de l'aquaculture
Fisheries and Oceans Canada / Pêches et Océans Canada
#103 - 2435 Mansfield Drive
Courtenay, B.C
Office | Bureau: 250 703 0915
Fax: 250 703 0921



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Canada

Chronology of Clayoquot Lice on Farms

Prior to March 1st, 2018 there were 4 farms with >3 motiles/fish: Millar Channel, Ross Pass, Dixon Bay and Bawden.

During the outmigration period (March 1-June 30, 2018), another 7 sites exceeded including: Saranac (exceeded March 19th, 2018), Mussel Rock (exceeded April 16th, 2018), Rant Point (exceeded April 16th, 2018), Bare Bluff (exceeded May 29th, 2018), Bedwell (exceeded May 28th, 2018), Fortune Channel (exceeded May 28th, 2018), Plover Point (exceeded May 29th, 2018).

May 11, 2018 email from I Keith to AQFF in box forwarding April 30, 2018 email from [REDACTED] @ Cermaq discussing Tofino lice issues – please read it.

Comment [MD1]: Email indicates Rant, Ross, Dixon, Saranac & Mussel and Bawden above 3 motile lice.

Bawden:

- Exceeded December 20th, 2017.
- Notification of SLICE treatment Jan 2, 2018
- No counts reported in Feb. 2018 due to recent SLICE treatment from Feb.1-7
- First reported count on March 6th, 2018 post-SLICE treatment exceeded (7.98 motile avg.)
 - No SLICE efficacy
- Absolute sea lice inventory increased steadily throughout out migration until the very end of June
 - Peroxide treatment performed June 11-24th, 2018
 - Pre-treatment counts of ~51 motiles/fish; Post-treatment counts still in exceedance (~5.7 motiles/fish); however absolute sea lice inventory did decrease in the last weeks of the outmigration
- DFO Fish Health staff conducted independent bioassay on May 31st, 2018 which subsequently confirmed SLICE resistance
- [REDACTED]
- MD emailed [REDACTED] June 6 (copy in AQFF inbox) as to why they hadn't reported SL overthreshold during the outmigration period (cc'd ZW, [REDACTED] HM)
 - Possible officially induced error if notification had been received prior to outmigration as per CoL 6.5(b)(c)

• No SL overabundance reports received.

Formatted: Normal, No bullets or numbering

Millar Channel:

Email notification SL overabundance June 2, 2017.

Comment [ZW2]: Was there any notification after the Aug 20th exceedance??

- Exceeded first August 20th, 2017
- Treated with SLICE beginning September 21st, 2017
- Next reported counts (performed Oct. 17, 18 and 20th, 2017) were still in exceedance

s.19(1)

s.21(1)(a)

s.21(1)(b)

- Greatly reduced SLICE efficacy
- Harvested out in April 2018
- Absolute sea lice inventory rose throughout March, 2018
- [REDACTED]

Ross Pass

Email notification SL overabundance June 2, 2017

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold.

- Exceeded Sept. 20th, 2017
- SLICE treatment performed Oct 1-7th, 2017
- First reported count post-treatment (performed Oct. 19-20, 2017) exceeded
 - Greatly reduced SLICE efficacy
- Harvested out in April 2018
- Absolute sea lice inventory decreased from March to April
- No strict licence condition violation (i.e. plan (harvest) did reduce absolute sea lice inventory within the outmigration period, despite entering outmigration in exceedance)

Comment [MD3]: Email to I Keith apparently served as notification of SL exceedance. It has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac

Dixon Bay

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold.

- Exceeded Sept. 17th, 2018
- SLICE treatment performed beginning Oct. 5th, 2017
- November 2017 counts exceeded
 - Greatly reduced SLICE efficacy
- Harvested out in June, 2018
- Absolute sea lice inventory increased throughout March and April 2018; declined very slightly in May
- [REDACTED]

Comment [MD4]: Email to I Keith apparently served as notification of SL exceedance. It has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac

Saranac

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold.

s.19(1)
s.21(1)(a)
s.21(1)(b)

Comment [MD5]: Email to I Keith apparently served as notification of SL exceedance. It has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac

- Exceeded March 19th, 2018
- Harvested out in July, 2018
- Absolute sea lice inventory increased throughout outmigration with a slight decrease during June 2018
- [REDACTED]

Mussel Rock

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold.

Comment [MD6]: Email to I Keith apparently served as notification of SL exceedance. It has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac.

- Exceeded April 16th, 2018
- Absolute sea lice inventory increased throughout outmigration
- Harvested out in July, 2018
- [REDACTED]

Rant Point

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold.

Comment [MD7]: Email to I Keith apparently served as notification of SL exceedance. It has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac.

- Exceeded April 16th, 2018
- Email notification April 30, 2018 – snip tool of SL numbers which is illegible. Indicating treatment at the site near the end of May.
- Absolute sea lice inventory increased throughout outmigration
- [REDACTED]

Bare Bluff

- Exceeded May 29, 2018
- Notification made June 5, 2018
- Email notification of SL mitigation plan June 8, 2018
- Peroxide treatment performed June 24-30, 2018
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~26 days after exceedance.
- [REDACTED]
- SLICE treatment performed Aug 16-22, 2018

Bedwell Sound

s.19(1)
s.21(1)(a)
s.21(1)(b)

- Exceeded May 28th, 2018
- Notification made June 5, 2018
- Peroxide treatment performed July 2-7, 2018 (outside outmigration window)
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~35 days after exceedance
- [REDACTED]
- SLICE treatment performed Aug 18-26, 2018

Fortune Channel

- Exceeded May 28th, 2018
- Notification made June 5, 2018
- Email notification of SL mitigation plan June 8, 2018
- Peroxide treatment performed beginning July 8, 2018 (outside outmigration window)
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~41 days after exceedance
- [REDACTED]
- SLICE treatment performed Aug 15-21, 2018
- Various management, sea lice and fish health concerns lead to site being culled beginning August 30th, 2018

Plover Point

- Exceeded May 29th, 2018
- Notification made June 5, 2018
- Peroxide treatment performed June 7-10, 2018
- Met CoL in that a plan was implemented within 15 days of exceedance which reduced absolute sea lice inventory
- SLICE treatment performed Aug 18-25, 2018

s.21(1)(a)

s.21(1)(b)

Maley, Shelley

From: Diamond, Maria
Sent: November-23-18 1:37 PM
To: Tomlinson, Daniel
Cc: Waddington, Zac
Subject: Tofino
Attachments: Chronology of Clayoquot Lice on Farms - MD additions.docx

Good afternoon Dan,

Zac has asked me to review Tofino Chronology of sea lice abundance document and match up any notifications and/or relevant emails that we have to the details in this document. I've copied the emails into a folder and have indicated throughout the document the name of the relevant email).

Hope this helps.

Regards,

Maria

Maria Diamond, B.Sc.

Aquatic Science Biologist / Biologiste en sciences aquatiques
Aquaculture Management Division / Gestion de l'aquaculture
Aquaculture Environmental Operations/Opérations environnementales de l'aquaculture
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Courtenay, B.C
Office | Bureau: 250 703 0915
Fax: 250 703 0921



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Chronology of Clayoquot Lice on Farms

Prior to March 1st, 2018 there were 4 farms with >3 motiles/fish: Millar Channel, Ross Pass, Dixon Bay and Bawden.

During the outmigration period (March 1-June 30, 2018), another 7 sites exceeded including: Saranac (exceeded March 19th, 2018), Mussel Rock (exceeded April 16th, 2018), Rant Point (exceeded April 16th, 2018), Bare Bluff (exceeded May 29th, 2018), Bedwell (exceeded May 28th, 2018), Fortune Channel (exceeded May 28th, 2018), Plover Point (exceeded May 29th, 2018).

May 11, 2018 email from I Keith to AQFF in box forwarding April 30, 2018 email from [REDACTED]@Cermaq discussing Tofino lice issues – please read it. (email: 2018-05-11 IK Fwd_tofino lice)**

Comment [MD1]: Email indicates Rant, Ross, Dixon, Saranac & Mussel and Bawden above 3 motile lice.

Bawden (BCF#227):

- Exceeded December 20th, 2017. (email: 2018-01-12 Confidential_Fw_COL 7.4 – Cermaq December 2017 Sealice Summary Revision)
- Notification of SLICE treatment Feb 1, 2018 (email: 2018-02-01_Confidential_COL 4.5 – Cermaq Canada Ref #227)
- No counts reported in Feb. 2018 due to recent SLICE treatment from Feb.1-7
- First reported count on March 6th, 2018 post-SLICE treatment exceeded (7.98 motile avg.)
 - No SLICE efficacy
- Absolute sea lice inventory increased steadily throughout out migration until the very end of June
 - Peroxide treatment performed June 11-24th, 2018
 - Pre-treatment counts of ~51 motiles/fish; Post-treatment counts still in exceedance (~5.7 motiles/fish); however absolute sea lice inventory did decrease in the last weeks of the outmigration
- DFO Fish Health staff conducted independent bioassay on May 31st, 2018 which subsequently confirmed SLICE resistance
- [REDACTED]
- MD emailed [REDACTED] June 22, 2018 (copy in AQFF inbox) as to why they hadn't reported SL overthreshold during the outmigration period (cc'd ZW [REDACTED] HM) (email: 2018-06-22 M Diamond email to [REDACTED] RE_Sea Lice Notification)

No SL overabundance reports received.

Millar Channel (BCF#1507):

Email notification SL overabundance June 2, 2017 (email: 2017-06-02 Millar & Ross COL 7.2 (a) – Cermaq Ref#314)

- Exceeded first August 20th, 2018

s.19(1)
s.21(1)(a)
s.21(1)(b)

- Treated with SLICE beginning September 21st, 2018
- Next reported counts (performed Oct. 17, 18 and 20th, 2017) were still in exceedance
 - Greatly reduced SLICE efficacy
- Harvested out in April 2018
- Absolute sea lice inventory rose throughout March, 2018
- [REDACTED]

Comment [MD2]: Is this supposed to be 2018?

Ross Pass (BCF#314):

Email notification SL overabundance June 2, 2017 (email: 2017-06-02 Millar & Ross COL 7.2 (a) – Cermaq Ref#314) (email: 2017-06-02 Millar & Ross COL 7.2 (a) – Cermaq Ref#314)

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold. (email: 2018-03-29_Confidential_RE Millar & Ross Harvest status)

Comment [MD3]: Email to I Keith apparently served as notification of SL exceedance... it has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac.

May 11, 2018 email from I Keith to AQFF in box forwarding April 30, 2018 email from [REDACTED] @ Cermaq discussing Tofino lice issues – please read [REDACTED] (email: 2018-05-11 IK Fwd_tofino lice)**

Comment [MD4]: Email indicates Rant, Ross, Dixon, Saranac & Mussel and Bawden above 3 motile lice.

- Exceeded Sept. 20th, 2017
- SLICE treatment performed Oct 1-7th, 2018
- First reported count post-treatment (performed Oct. 19-20, 2017) exceeded
 - Greatly reduced SLICE efficacy
- Harvested out in April 2018
- Absolute sea lice inventory decreased from March to April
- No strict licence condition violation (i.e. plan (harvest) did reduce absolute sea lice inventory within the outmigration period, despite entering outmigration in exceedance)

Dixon Bay (BCF#234):

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold.

May 11, 2018 email from I Keith to AQFF in box forwarding April 30, 2018 email from [REDACTED] @ Cermaq discussing Tofino lice issues – please read [REDACTED] (email: 2018-05-11 IK Fwd_tofino lice)**

Comment [MD5]: Email to I Keith apparently served as notification of SL exceedance... it has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac.

Comment [MD6]: Email indicates Rant, Ross, Dixon, Saranac & Mussel and Bawden above 3 motile lice.

- Exceeded Sept. 17th, 2018
- SLICE treatment performed beginning Oct. 5th, 2018
- November 2017 counts exceeded
 - Greatly reduced SLICE efficacy
- Harvested out in June, 2018

s.19(1)
s.21(1)(a)
s.21(1)(b)

- Absolute sea lice inventory increased throughout March and April 2018; declined very slightly in May
- [REDACTED]

Saranac (BCF#527):

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold.

May 11, 2018 email from I Keith to AQFF in box forwarding April 30, 2018 email from [REDACTED] @ Cermaq discussing Tofino lice issues – please read it. (email: 2018-05-11 IK Fwd tofino lice)**

Comment [MD7]: Email to I Keith apparently served as notification of SL exceedance... it has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac

Comment [MD8]: Email indicates Rant, Ross, Dixon, Saranac & Mussel and Bawden above 3 motile lice.

- Exceeded March 19th, 2018
- Harvested out in July, 2018
- Saranac lice notification (email: 2018-08-22 Saranac Lice Notification)
- Absolute sea lice inventory increased throughout outmigration with a slight decrease during June 2018
- [REDACTED]

Mussel Rock (BCF#543):

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold.

May 11, 2018 email from I Keith to AQFF in box forwarding April 30, 2018 email from [REDACTED] @ Cermaq discussing Tofino lice issues – please read it. (email: 2018-05-11 IK Fwd tofino lice)**

Comment [MD9]: Email to I Keith apparently served as notification of SL exceedance... it has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac

Comment [MD10]: Email indicates Rant, Ross, Dixon, Saranac & Mussel and Bawden above 3 motile lice.

- Exceeded April 16th, 2018
- Absolute sea lice inventory increased throughout outmigration
- Harvested out in July, 2018
- [REDACTED]

Rant Point (BCF#526):

March 29, 2018 email to I Keith & AQFF providing requested SL counts for Millar, Ross & Dixon by I Keith. [REDACTED] states in the email that it serves as notification of exceedance of threshold.

Comment [MD11]: Email to I Keith apparently served as notification of SL exceedance... it has an attachment with SL numbers for Bawden, Dixon, Millar, Ross and Saranac

- Exceeded April 16th, 2018

s.19(1)

s.21(1)(a)

s.21(1)(b)

- Email notification April 30, 2018 – snip tool of SL numbers which is illegible. Indicating treatment at the site near the end of May. (email: 2018-04-30 Rant Notification_Confidential_COL 7.3 Cermaq Ref 526)
- May 11, 2018 email from I Keith to AQFF in box forwarding April 30, 2018 email from [REDACTED]@ Cermaq discussing Tofino lice issues – please read it . (email: 2018-05-11 IK Fwd_tofino lice)**
- Absolute sea lice inventory increased throughout outmigration
- [REDACTED]

Bare Bluff (BCF#1537):

SL notification (email: 2017-03-15 Bare Bluff notification)

Mitigation plan (email 2017-03-16 Mitigation Plan RE_Bare Bluff notification COL 7.29 (a)(b))

- Exceeded May 29, 2018 Notification made June 5, 2018 (email: 2018-06-05 Bare Bluff SL Notification...)
- Email notification of SL mitigation plan June 8, 2018 (email: 2018-06-08 Bare Bluff SL Mitigation Plan....)
- Peroxide treatment performed June 24-30, 2018
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~26 days after exceedance.
- [REDACTED]
- SLICE treatment performed Aug 16-22, 2018

Bedwell Sound (BCF#526):

- Exceeded May 28th, 2018
- Notification made June 5, 2018 (email: 2018-06-05 Bedwell overabundance notification...)
- Peroxide treatment performed July 2-7, 2018 (outside outmigration window)
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~35 days after exceedance
- [REDACTED]
- SLICE treatment performed Aug 18-26, 2018
- Bedwell SLICE treatment (email: 2018-08-16 Bedwell SLICE treatment...)

Fortune Channel (BCF#540):

(email: 2017-08-17 Fish Lice Notification – Fortune Channel)

(email: 2017-08-22 IK re SL abundance threshold and Fortune Channel)

s.19(1)

s.21(1)(a)

s.21(1)(b)

- Exceeded May 28th, 2018

Notification made June 5, 2018 (email: 2018-06-05 Fortune overabundance notification...)

- Email notification of SL mitigation plan June 8, 2018 (email: 2018-06-08 Fortune SL mitigation...)
- Peroxide treatment performed beginning July 8, 2018 (outside outmigration window)
- Did not implement a plan within 15 days of exceedance to reduce absolute sea lice inventory as per CoL 6.4 (a)
 - Peroxide treatment conducted ~41 days after exceedance
- [REDACTED]
- SLICE treatment performed Aug 15-21, 2018 (email: 2018-08-16 Fortune SL treatment...)
- Various management, sea lice and fish health concerns lead to site being culled beginning August 30th, 2018

Plover Point (BCF#6668):

- Exceeded May 29th, 2018
- Notification made June 5, 2018 (email: 2018-06-05 Plover SL overabundance...)
- Peroxide treatment performed June 7-10, 2018
- Met CoL in that a plan was implemented within 15 days of exceedance which reduced absolute sea lice inventory
- SLICE treatment performed Aug 18-25, 2018 (email: 2018-08-16 Plover SLICE treatment...)

Binns (BCF#1148):

- Email: 2017-03-24 Binns Notification...)
- Email: 2017-03-28 Binns Harvest Plan...)
- Email: 2017-04-04 Binns _Cermaq Canada Ltd Section 6(d)...) SLICE treatment

s.21(1)(a)

s.21(1)(b)

Maley, Shelley

From: Paylor, Adrienne
Sent: December-12-18 2:02 PM
To: Waddington, Zac; McConnachie, Sarah
Subject: FW: Ian's vet to vet letter send to Greig
Attachments: Oct 2017 [REDACTED] re sept 25 call.doc

Hey,
I was just cleaning up some documents for ATIP and came across this letter Ian sent to Greig last year regarding Nooka and sea lice challenges.....thought it may be of interest to you if you haven't seen it given the analyses you guys just wrote on Lutes.
Adrienne

From: Keith, Ian
Sent: Monday, October 09, 2017 2:35 AM
To: [REDACTED]
Cc: Paylor, Adrienne
Subject: SOPs for 2.4

[REDACTED]
Please see the attached. I will be in the office Tuesday should you wish to discuss.
Regards,
Ian

s.19(1)

9 October, 2017

Hi [REDACTED]

A follow-up from your call Monday, 25 September, as we haven't received the Health Management SOPs to date, and the submission date is approaching fast.

To what you had to share in the call as it pertains to SOPs: You said you planned to "peroxide all Nootka." I don't know when or how large the lice recruitment to Gore Island will be but expect you are anticipating recruitment soon and management of lice in Nootka and Esperanza has to be by hydrogen peroxide bath, Hydrolicer or freshwater bath. We were told that these new technologies would allow health management at the Gore Island site, and given the repeated SLICE failures in Nootka last production cycle, these technologies will be required in the cluster of Atrevida, Concepcion, Gore and Williamson, and emamectin benzoate use will not be permitted on these farms until further notice. With the unknowns concerning the SLICE resistance in Esperanza Inlet and 10 months of disseminating these lice in the inlet unchecked, these new technologies will be required in Esperanza, Steamer and Hecate as well, and emamectin benzoate use will not be permitted on these farms until further notice. With the Arriagada et al. (2016) paper describing the seasonal low salinity effects on sea lice biology in the area, management with these new technologies on these farms is feasible, and with the addition of production at Gore and Hecate, the potential lice burden in the area increases and management has to adjust accordingly.

In the last production cycle in Nootka, there was failed SLICE treatment at Atrevida (August 2015) and at Williamson (April 2016). The new production cycle began with stocking of Atrevida in September 2016 and September would provide ideal conditions for infestation with hatch from the resistant lice from the nearest neighbour, Williamson as Williamson fish were not finished harvesting until August. Concepcion was, in turn, stocked in November 2016, and would have been vulnerable to infestation with hatch from the resistant lice from Atrevida (nearest neighbour to Concepcion). These fish are being transferred to Gore so there is risk of direct transfer of resistant lice known in the past production cycle. There is also such close proximity of these source sites to Gore that there is risk of indirect transfer of resistance lice from these neighbouring farms too, removing the advantage that a new site otherwise has in terms of exposure (to pathogens and pests). Gore is therefore at risk for SLICE resistant lice from last production cycle, as are Concepcion, Atrevida and Williamson.

Although male lice from wild fish are expected to breed the resistant females in the fall, and the progeny will be the majority of the winter and spring sets of lice found on Concepcion fish, the bioassay data does not provide sufficient predictability of SLICE efficacy; resistant lice are expected to be amongst the population on the fish from Atrevida and Concepcion. You told me you weren't going to use the opportunity of the transfer to Gore to start the peroxide treatments. [REDACTED]

[REDACTED] that you haven't experience with this well boat as yet. I understand, and also appreciate that preserving the lamellar epithelium is of particular importance to you as these fish will require many peroxide treatments for lice management by the time harvest is complete. However, I am raising my

s.19(1)

s.20(1)(b)

concern that at current temperatures and without the reduction of burden during transfer, equipment should be at the ready.

Your post-treatment tissue drug concentration data from Esperanza and Steamer (September 2016), from no detection to sub-therapeutic to target levels, demonstrates the sub-therapeutic risk that Sonja and I have attributed incremental SLICE resistance to. Grieg staff insisted that "natural" size variation will not be remedied during transfer, or after transfer, and so proper dosage for in-feed treatments of fish won't be possible. Please know [REDACTED] that with the a new feeding system at Gore proper cyclic feeding would be possible to make the food indefensible by dominant fish, implying that in-feed treatments would be possible. In analogous situations, where companies have failed to meet regulatory standards and so have adopted technologies or strategies that they claim will allow them to meet fish health requirements DFO has said that the company would have to prove their claims through two production cycles. There won't be exceptions made for Grieg.

Lastly, reference to incremental increase in resistance made above was deliberate as the resistance seen in Esperanza Inlet requires special attention. The EC_{50} levels in Esperanza Inlet, being well above any we have seen for this fish health zone or any zone, doesn't fit the incremental rise we have seen elsewhere. Factors influencing lice bioassay end points bring uncertainties for interpretation but you repeated the assay and temperatures of the bioassay and the field were very close, so the assay itself appears to be sound. This raises the concern that a different resistance mechanism was selected for and a lot of these lice were produced. (Polygenetic and monogenetic mutation is discussed in the attached paper.) There was anomalously low abundance in 2014 in Esperanza with no evidence of lice recruitment from wild fish in Fall 2014 and at no point was threshold met. Two SLICE treatments (August and December 2014) of what appears to be the same lice population would therefore be at greater risk of selecting for resistant lice and with a smaller population, there could be mechanisms different from what we've seen before. Restocking Steamer after one month fallow, in September 2015 would, as said above for Nootka, fail to break the cycle if there was resistance.

I trust that you have engineers installing the hydrogen peroxide diffusers in the well boat, and the barge fitted for the Hydrolicer so that you are ready when the regulatory abundance threshold is met. The SOPs are expected to reflect these area and farm-specific requirements; complete with disinfection protocols for movement of the well boat and Hydrolicer equipment between Nootka and Esperanza Inlet.

Regards,

Ian Keith

CERMAQ

Zac Waddington
Fisheries and Oceans Canada
Aquaculture Management Division, Snr Fish Vet
#103 – 2435 Mansfield Drive ,Courtenay, BC

Campbell River, 23 January 2019

2019 YC Clayoquot Sound (Tofino South) Sea Lice Management Plan

Dear Zac,

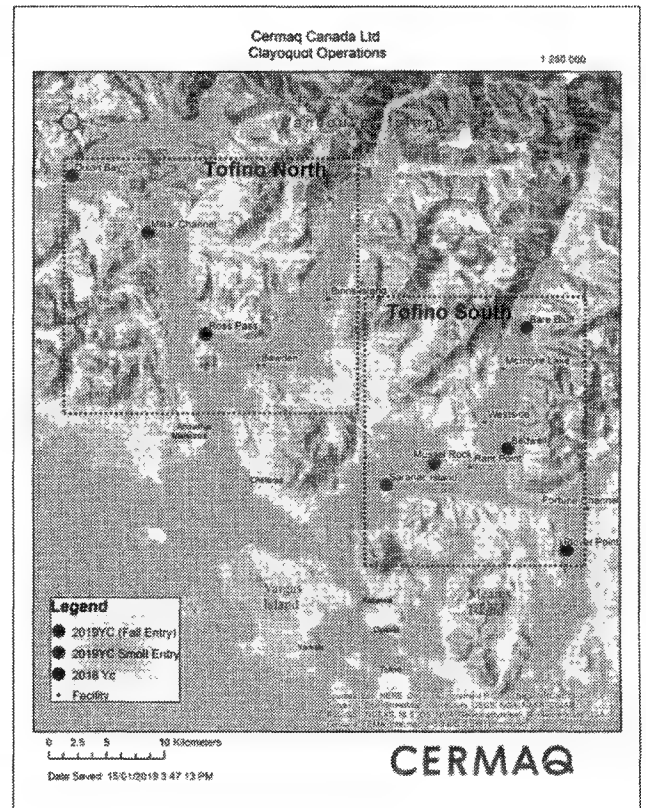
Please find below the measures that Cermaq Canada is implementing to mitigate against sea lice during the entry of our 2019 Year Class Spring Entry Smolts into the Clayoquot Sound Region.

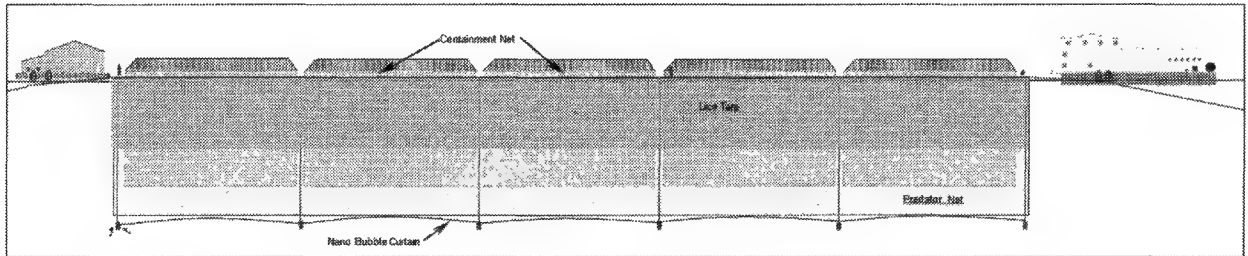
2019 Spring Smolt Entry Location

- All spring smolt entries will be entered into Tofino South Cypress Bay area only (Mussel & Saranac).
- Rant Point will not be used to maximise site separation with Bedwell.
- 2018 YC Harvest will commence in February and Bedwell Sound will be empty by mid-June.

Infrastructure Mitigation

- Receiving sites will be set up with sea lice skirts (10m depth) and 25m deep bubble curtains and diffusers.
- Skirts will be deployed and bubble curtains will be running for 2 weeks prior to smolt entry.
- Cermaqs' new hydrolicer barge is expected to be in operation in the Clayoquot region by July.

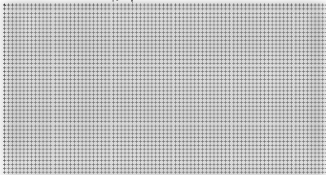




Therapeutant Mitigation

- EDR's for Imvixa (Lufenuron) have been issued for smolts coming from Boot Lagoon and Oceans Hatchery. This treatment will be fed to the smolts as prescribed two weeks prior to transport.
- Production fish currently in Bedwell Sound at Bedwell (#520) and Bare Bluff (#1537) will both undergo Paramove treatments starting at the end of January prior to the 2019YC smolts being transported to reduce lice loads in the area.

Kind regards,



Cermaq Canada Ltd

Email: 

CC: Melanie McNabb (Governance Coordinator) SalmonITC@dfo-mpo.gc.ca

s.19(1)

Maley, Shelley

From: Waddington, Zac
Sent: January-24-19 4:28 PM
To: McConnachie, Sarah
Subject: RE:

Yes indeed! Thanks a bunch for tackling that,

Zac

From: McConnachie, Sarah
Sent: January-24-19 4:28 PM
To: Waddington, Zac
Subject:

I wrote these 2 sentences for changing trends in sea lice: **2018 → Increasing incidence of SLICE resistance in *L. salmonis* (Pacific region) was seen in 2018, especially on the west coast of Vancouver Island. Unusually, 4 farms reported outbreaks of *Caligus* spp., severe enough to warrant treatment and even culling in 2018.**

Good?

Dr. Sarah McConnachie MSc, PhD, DVM
Field Operations Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia
Telephone | Téléphone: 250-703-0917
Fax | Télécopieur: 250-703-0921
Sarah.McConnachie@dfo-mpo.gc.ca



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Maley, Shelley

From: McConnachie, Sarah
Sent: January-31-19 2:45 PM
To: Jones, Simon
Subject: RE: Canada National Report for ICES WGPDMO

1 farm was culled after failed treatment response (environmentals in the region inhibited SLICE consumption); All warranted treatment

From: Jones, Simon
Sent: January-31-19 1:18 PM
To: McConnachie, Sarah
Subject: RE: Canada National Report for ICES WGPDMO

Hi Sarah,

Apologies for not putting all my questions together in 1 mail. Regarding the Caligus outbreaks on 4 farms: did all 4 require treatment and were all 4 culled as a result?

Thanks,
Simon

From: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Sent: Friday, January 25, 2019 2:27 PM
To: Jones, Simon <Simon.Jones@dfo-mpo.gc.ca>
Cc: Manchester, Howie <Howie.Manchester@dfo-mpo.gc.ca>; Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Subject: RE: Canada National Report for ICES WGPDMO

Hey Simon – See below in red for our attempt to answer your Qs

From: Jones, Simon
Sent: January-25-19 9:59 AM
To: McConnachie, Sarah
Cc: Waddington, Zac
Subject: RE: Canada National Report for ICES WGPDMO

Hi Sarah,

Some questions...

SRS – same management zones?, number fewer?, number additional?

- Fish health events in 2018 occurred in 2 zones, same zones as seen historically. By PCR it was detected in 5/7 fish health zones in 2018, whereas in 2016 and 2017 occurred in 6/7 zones.

BKD – both farms in same management zone?

- One was Chinooks in zone 2.3 the other was Atlantics in zone 3.3.

Furunc – both farms same management zone? Confirm vaccinated?

- Both are in zone 3.3, the bacteria was Atypical *A.salmonicida*. All fish are IP vaccinated against the regular *A.salmonicida* but not Atypical.

Winter ulcer – please confirm: of the 29/831 with UD histological lesions, only 7 cultured positive for moritella?

Yes Vaccine is based on *Moritella viscosa* or other spp? I believe *M.viscosa* Is this accurate: in BC, role of *M. viscosa* in initiation/development of “winter ulcer” aetiology in BC is uncertain?

Note from Zac → Vaccine is based on *Moritella viscosa*; however it anecdotally appears that regional isolates greatly impact vaccine efficacy. Vaccines made with east coast isolates not found to confer significant cross protection in BC. Even within BC, regional isolates appear very distinct with little cross protection conferred by single valent vaccine. I am not aware of any laboratory challenge studies to determine pathogenicity of BC isolates of *Moritella viscosa*. Anecdotally, outbreaks of winter ulcer (and skin ulcers in general), seem to be precipitated by prior skin compromise. Eg. significant saprolegnia infection in hatchery, poor transfer, over crowding, recent handling/treatment. Anecdotally, genetics of salmon appear to have significant effects on disease manifestation. Some farms have two different breeds of salmon and manifestation of disease is radically different between salmon breeds (Mowi vs. Mowi/McConnel).

Fungal – diagnosis by gross necropsy, histology, culture or PCR?

- Histologic. Infection is thought to take a chronic course similar to BKD and would be sourced from hatchery life phase

Thanks for spending the time on this.

Simon

From: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>

Sent: Thursday, January 24, 2019 4:32 PM

To: Jones, Simon <Simon.Jones@dfo-mpo.gc.ca>

Cc: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>

Subject: RE: Canada National Report for ICES WGPDMO

I've added 2018 trends within the document you provided. Let me know if you need any further clarification on anything.

Sarah

In total, based on the spreadsheets, there were 831 carcasses sampled; with 205 pools for PCR analysis.

1.2 Farmed fish

VIRUSES → in 2018, no viruses of concern (sampled via the DFO audit program; IHN, IPN, ISA, VHS, SAV) were detected thus there are no new trends for the Pacific region to report; the audit program did not test for PRV in 2018, so data is not available (from us)

Salmon Gill Poxvirus – No new trends.

Piscine Orthoreovirus (PRV) – The first Canadian case of HSMI was described from Atlantic salmon in Western Canada in 2013-2014 and published in 2017. Characteristic histological lesions were present in 80% - 100% of sampled fish. Clinical signs were mild and there was no HSMI-specific mortality. The prevalence of PRV was statistically correlated with the occurrence and severity of histopathological lesions in the heart.

Infectious Salmon Anemia Virus (ISAV) – No new trends. Infections in Atlantic salmon continue to be reported in Eastern Canada.

Infectious Haematopoietic Necrosis Virus (IHNV) – No new trends. The last detection in Atlantic salmon in Western Canada occurred in 2012.

Viral Hemorrhagic Septicemia Virus (VHSV) North American (NA) Strain – No new trends. The virus continues to be sporadically detected in Atlantic salmon in Western Canada.

Infectious Pancreatic Necrosis Virus (IPNV) – No new trends.

BACTERIA

Piscirickettsia salmonis – in Western Canada, the number of fish health audit samples testing positive for the bacteria by PCR declined from 29 of 117 (24.8%) in 2016 to 15 of 120 (12.5%) in 2017. Three farms treated for salmonid rickettsial septicaemia in 2017, down from six requiring treatment in 2016.

2018:

- Number of positive pools by PCR: 33/205 (16.10%)
- Positive detections of SRS-presumed lesions from audit data, severe enough to be an explanation for cause of death as determined by the pathologists in Abbotsford: 49/831 (5.90%)
- 4 farms required treatment for SRS in 2018 Was 3 farms in 2017; 6 farms in 2016

Renibacterium salmoninarum – No new trends. 27 cases in Atlantic salmon reported in 2017 in Western Canada.

2018:

- 2 farms in Western Canada required treatment for BKD in 2018
- In 2018, histology determined that 10/831 (1.20%) of fish observed in the audit program had severe enough BKD-related lesions as to be an explanatory cause of death in those individuals

Yersinia ruckeri – No new trends. Six cases in Atlantic salmon reported in 2017 in Western Canada.

Aeromonas salmonicida – No new trends. 26 cases in Atlantic salmon reported in 2017 in Western Canada.

2018:

- 2 reported cases where farms required treatment for *A. salmonicida* in 2018
- For the audit program in 2018:
 - o 18/831 (2.15%) had positive growth on agar plates
 - o 20/831 (2.41%) of audited fish had *A.sal*-related lesions severe enough to be the explanatory cause of death in those individuals.

OTHER BACTERIAL TRENDS FOR 2018:

- The audit program detected the following:
 - o *Moritella* spp.
 - Despite making observations of “winter ulcer” on numerous fish, our bacteriology testing only isolated *Moritella* spp. 7/831 (0.84%) individuals
 - Our current isolation technique is not sensitive enough to show an accurate representation of what is happening in the field
 - Via histology, 29/831 (3.49%) of fish were stated to have “ulcerative dermatitis” severe enough to be an explanation of cause of death; often bacteria are present within lesions
 - Would be good to list the reported number of cases for Winter ulcer by industry for 2018
 - With comparison to 2017/2016 and a discussion on how continued work is needed to increase sensitivity for diagnostic testing; industry used PCR testing; there is also vaccine development occurring for Pacific-specific strains that most companies added to smolt vaccines in 2018
 - 4 farms reported requiring treatment for winter ulcer in 2018
 - o *Tenacibaculum* spp.
 - We currently do not isolate the causative agent for mouthrot
 - Via histology, 47/831 (5.66%) of fish had “ulcerative stomatitis” lesions severe enough to contribute to the cause of death for fish observed in the audit program
 - 27 farms require treatment for bacterial stomatitis/yellow mouth/mouth rot in 2018
 - o *Vibrio* spp. Cultured via bacteriology

- 7/831 (0.84%) *Vibrio* spp.
- 3/831 (0.36%) *Vibrio anguillarum*
- 1/831 (0.12%) *Pseudomonas* spp. isolated

PARASITES

Lepeophtheirus salmonis – No new trends.

2018 → Increasing incidence of SLICE resistance in *L. salmonis* (Pacific region) was seen in 2018, especially on the west coast of Vancouver Island. Unusually, 4 farms reported outbreaks of *Caligus* spp., severe enough to warrant treatment - and even culling - in 2018.

Paramoeba perurans – No new trends. *Paramoeba* sp. was found in 2 of 784 Atlantic salmon sampled in Western Canada. Clinical AGD was not reported.

2018 → PCR samples have not been processed yet

- Via histology, 10/831 (1.20%) of fish had severe enough lesions attributed to *P. perurans* to be an explanatory variable in cause of death
- No industry-reported fish health events for AGD requiring treatment noted

Desmozoon lepeophtherii – the microsporidian was detected by qPCR in the gills of 157 of 165 gill samples (95.2%) from Atlantic salmon on 3 farms in 2016 and analysed in 2017. Severity of the infection increased during a mortality event (median Ct-healthy: 28.9; median Ct-moribund: 19.0).

Ichthyobodo salmonis – the flagellated protist was detected by qPCR in 56 of 165 gill samples (33.9%) from Atlantic salmon on 3 farms. This report provides the first evidence of *I. salmonis* in Atlantic salmon from Western Canada.

OTHER TRENDS:

- Intralesional pigmented fungal infections anecdotally are increasing → in 2018, 11/831 (0.12%) infections were deemed severe enough to contribute to the death of an individual via histological assessment
 - Not sure if we want to discuss this trend, or if there is a comparison from 2017

From: Jones, Simon

Sent: January-22-19 8:55 AM

To: Waddington, Zac; McConnachie, Sarah

Subject: FW: Canada National Report for ICES WGPDMO

Hi Zac and Sarah,

Further to my earlier email, are there audit data for 2018 that are available for our ICES Canada report? Specifically, information on *P. salmonis*, AGD and winter ulcer. Last year's report is attached for context. Winter ulcer has not been reported but contemporary and historical information will be helpful.

As mentioned earlier, I will need this information by end of the week.

Thanks in advance.

Simon

From: Jones, Simon
Sent: Thursday, January 3, 2019 4:58 PM
Subject: Canada National Report for ICES WGPDMO

Dear Aquatic Animal Health Colleagues:

I am collating our collective and relevant observations in 2018 for the Canada National Report for the ICES expert group on pathology and diseases of marine organisms (WGPDMO). Please update the most recent Canada report to the ICES WGPDMO (attached) with your observations for wild and farmed finfish and shellfish species last year. The report emphasises significant observations and changes from previous years, rather than listing ongoing observations of pathogens or diseases. Long-term data sets are valuable however, when they provide the context for changing trends. For your information, previous annual reports and other information concerning the working group may be found at: <http://www.ices.dk/community/groups/Pages/WGPDMO.aspx>

Our annual meeting this year is early February and I look forward to hearing from you by January 25.

Thanks in advance for your contributions.

Simon

Simon R.M. Jones
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Tel: 250 729 8351
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E-mail: simon.jones@dfo-mpo.gc.ca

<https://profiles-profiles.science.gc.ca/en/profile/simon-jones>

<https://scholar.google.ca/citations?user=JlvmjCwAAAAJ&hl=en>

Maley, Shelley

From: Waddington, Zac
Sent: February-01-19 1:53 PM
To: Sandberg, Krista; McConnachie, Sarah
Subject: RE: December sea lice report ready for your review

I have reviewed this and just got the info I needed from Cermaq. Please see my comments and it should be good to go otherwise,

Zac

From: Sandberg, Krista
Sent: January-22-19 9:10 AM
To: McConnachie, Sarah; Waddington, Zac
Subject: December sea lice report ready for your review

Hi Sarah and Zac,

The December sea lice report is ready for your review. Nothing crazy. A few sites slightly over threshold with Slice planned for several MH sites. Performing bioassays at Bare Bluff prior to treatment, as I'm sure you are aware.

Cheers,
Krista.

Summary: \\Dcbcvanna01b\VAN RHQ 4\Aqua\1. PUBLIC REPORTING\9. Sea Lice\1. Farm Level - Monthly\2018\2018 Farm Level Sea Lice Summary.xlsx

Working file: \\Dcbcvanna01b\VAN RHQ 4\Aqua\1. PUBLIC REPORTING\9. Sea Lice\1. Farm Level - Monthly\2018\SL Farm Level Calculator 2018.xls

Krista Sandberg

Public Reporting Manager | Gestionnaire de rapports publics
Aquaculture Management Division | Gestion de l'aquaculture
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Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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s.16(2)(c)

Maley, Shelley

From: Manchester, Howie
Sent: February-01-19 5:25 PM
To: MacDonald, Cristopher
Cc: Waddington, Zac; Shaw, Kerra
Subject: RE: SL Presentation

Hi Cris,

I had a look though and did not see any misinformation or contradictions.

How long is it supposed to be? Looks like it will be 10 – 15 minutes?

Not sure if you want to mention or if Zac will cover this but I believe the 2016 – 2017 SLICE failure in Esperanza was due to SLICE tolerance (resistance) (indicated by Bioassay results) while in the next generation in that area 2018 – 19 it looks more like the failure may have been due to not getting the treatment to the fish due to blooms (also many non performers in the pens with lice that did not eat the SLICE – source of lice post treatment). I think Zac will cover this though.

Looks good.

Howie

From: MacDonald, Cristopher
Sent: January-31-19 6:28 PM
To: Manchester, Howie; Waddington, Zac
Cc: Shaw, Kerra
Subject: RE: SL Presentation


Here is what my presentation looks like at the moment. I'd love it if you guys had some time to look through it and make sure I don't have any misinformation/contradictions etc.

Thanks!

\\Dcbcvanna01b\VAN_RHQ_4\Aqua\AEO\2. Marine Finfish AEO\Sea Lice - Beach Seining\All Staff Pres\Wild Salmon Sea Lice Monitoring.pptx

From: Manchester, Howie
Sent: January-31-19 3:39 PM
To: MacDonald, Cristopher; Waddington, Zac
Subject: RE: SL Presentation

Hi Cris,

Zac probably has a more recent information on this subject , 
Here are a couple of older papers I had in my files on the subject.

Howie

s.19(1)

From: MacDonald, Cristopher
Sent: January-31-19 12:41 PM

To: Manchester, Howie; Waddington, Zac
Subject: SL Presentation

Hey guys,

I am just finishing up my presentation and I was wondering if you guys have a DFO stance on the effects of SL abundances of farms on wild salmon SL infestation?

And whether you know of any new science or research going on in that realm that may have some insight?

I will also send you guys a final copy of the presentation to look over by the end of the day today.

Thanks a bunch,

Cristopher MacDonald
Finfish Aquaculture Biologist | Biologiste de l'aquaculture
Fisheries and Oceans Canada | Pêches et Océans Canada
cristopher.macdonald@dfo-mpo.gc.ca
Cellular | Cellulaire 778-585-0032
Office | Bureau [REDACTED]



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s.16(2)(c)

Maley, Shelley

From: McConnachie, Sarah
Sent: February-11-19 1:54 PM
To: Waddington, Zac
Cc: Webb, Allison; Paylor, Adrienne
Subject: Re: PARR mtg in Ottawa

Sounds good - Zac you and I should meet to come up with a list of things to present.

Sent from my iPhone

On Feb 11, 2019, at 1:46 PM, Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca> wrote:

Good to know. I would suggest that sea lice resistance (and resulting management challenges) would be the largest emerging issue that springs to mind. Sarah or myself could speak to that if that would be helpful? I think especially in the context of this Area Based Management initiative the consideration of sea lice transmission between farms is paramount and timely.

Zac

From: Webb, Allison
Sent: February-11-19 11:04 AM
To: Paylor, Adrienne; Waddington, Zac; McConnachie, Sarah
Subject: FW: PARR mtg in Ottawa

For discussion

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Burgetz, Ingrid <Ingrid.Burgetz@dfo-mpo.gc.ca>
Sent: Wednesday, January 30, 2019 1:41 PM
To: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>; Parsons, Jay <Jay.Parsons@dfo-mpo.gc.ca>
Subject: RE: PARR mtg in Ottawa

Hi Allison,
Yes, it's scheduled for Feb 26-27. We are constructing the agenda – would you or Zak be able to give a brief presentation on what fish health challenges you have and are currently facing in the management of aquaculture to set the stage for the fish health presentations?
Thanks, Ingrid

From: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>
Sent: January-30-19 4:35 PM
To: Burgetz, Ingrid <Ingrid.Burgetz@dfo-mpo.gc.ca>; Parsons, Jay <Jay.Parsons@dfo-mpo.gc.ca>
Subject: PARR mtg in Ottawa

Hi Ingrid and Jay - can you please confirm that we are going ahead with the meeting in Ottawa Feb 26-27 as need to make travel arrangements soonish if it is going ahead.

Thx so much,
Allison

Sent from my BlackBerry 10 smartphone on the Bell network.

No information has been removed or severed from this page

Maley, Shelley

From: Webb, Allison
Sent: February-11-19 6:31 PM
To: Waddington, Zac; Paylor, Adrienne; McConnachie, Sarah
Subject: RE: PARR mtg in Ottawa

We'll have some further discussions on this at the management level, but you'll need to consider putting a presentation together that maybe Sarah and I can tag team it on. Tx.

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Sent: Monday, February 11, 2019 1:46 PM
To: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>; Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>; McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Subject: RE: PARR mtg in Ottawa

Good to know. I would suggest that sea lice resistance (and resulting management challenges) would be the largest emerging issue that springs to mind. Sarah or myself could speak to that if that would be helpful? I think especially in the context of this Area Based Management initiative the consideration of sea lice transmission between farms is paramount and timely.

Zac

From: Webb, Allison
Sent: February-11-19 11:04 AM
To: Paylor, Adrienne; Waddington, Zac; McConnachie, Sarah
Subject: FW: PARR mtg in Ottawa

For discussion

Allison Webb, Director / Directrice
Aquaculture Management / Gestion de l'aquaculture
Fisheries Management Branch / Direction de la gestion des pêches
Fisheries and Oceans Canada / Pêches et Océans Canada
200 - 401 Burrard St / Rue Burrard, Vancouver BC / C.B. V6C 3S4 Canada
604-666-7009
Allison.webb@dfo-mpo.gc.ca

From: Burgetz, Ingrid <Ingrid.Burgetz@dfo-mpo.gc.ca>
Sent: Wednesday, January 30, 2019 1:41 PM
To: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>; Parsons, Jay <Jay.Parsons@dfo-mpo.gc.ca>
Subject: RE: PARR mtg in Ottawa

Hi Allison,

Yes, it's scheduled for Feb 26-27. We are constructing the agenda – would you or Zak be able to give a brief presentation on what fish health challenges you have and are currently facing in the management of aquaculture to set the stage for the fish health presentations?

Thanks, Ingrid

From: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>

Sent: January-30-19 4:35 PM

To: Burgetz, Ingrid <Ingrid.Burgetz@dfo-mpo.gc.ca>; Parsons, Jay <Jay.Parsons@dfo-mpo.gc.ca>

Subject: PARR mtg in Ottawa

Hi Ingrid and Jay - can you please confirm that we are going ahead with the meeting in Ottawa Feb 26-27 as need to make travel arrangements soonish if it is going ahead.

Thx so much,
Allison

Sent from my BlackBerry 10 smartphone on the Bell network.

Maley, Shelley

From: Rainer, Michelle
Sent: April-01-19 1:22 PM
To: McConnachie, Sarah; Paylor, Adrienne; Waddington, Zac
Subject: RE: Sea Lice form letter

Thanks, Sarah, that's great.
Michelle

From: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Sent: April-01-19 1:09 PM
To: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>; Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>; Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Subject: RE: Sea Lice form letter

Michelle – See below for notes regarding your request for the following information:

- Regarding the use and licensing of Lufenuron **Please add info. Did we approve this? If not, who did? What can we say about its safety and efficacy?**
- Drugs used in salmon aquaculture are approved and managed by Health Canada. The issuance of emergency drug releases (EDR) is also managed by Health Canada through the Veterinary Drugs Directorate (VDD), which works to protect human and animal health and the safety of Canada's food supply. DFO was not involved in the application or review process for the Lufenuron EDR, but we were notified by Cermaq Canada of its use in their sea lice mitigation plan. DFO supports the use of varied treatment applications to ensure that sea lice resistance to available drugs does not become a widespread problem. Varied treatment choices are consistent with a responsible integrated pest management approach to sea lice mitigation.
 - The idea is to use Lufenuron once during each production cycle, before ocean entry. Upon ocean entry, the fish should be protected from sea lice infestation for up to 6-9 months, after which other treatment modalities can be utilized once the effectiveness period is over. This will reduce the reliance on emamectin benzoate (SLICE®), hydrogen peroxide use, and other stressful treatment modalities.
- Lufenuron is used widely and safely in veterinary medicine as a topical flea/parasite preventative for dogs and cats. It is also widely used in agriculture as an anti-fungal agent on crops such as grapes and potatoes. Lufenuron has recently been developed as a new in-feed treatment for sea lice. It has been widely used under the trade name Imvixa™ in Chile, and is under consideration for use in North America and Europe. In Chile, Imvixa is administered to the fish in their food while they are being reared in freshwater facilities so it does not enter the environment directly during treatment. Following treatment, the fish are held for at least 7 additional days to allow excretion of unabsorbed, active pharmaceutical before they are transferred to marine sites. This same procedure was followed by Cermaq Canada. Field use in Chile has shown that the treatment has been highly effective for up to 8 months following seawater transfer.
 - Lufenuron is absorbed into the fat of an animal and is transferred into tissues that are consumed by parasitizing sea lice. The drug effectively inhibits chitin synthesis within 24-48 hours of exposure, which inhibits lice moulting to different life stages, and also reduces egg viability.

- Regarding the risk that the use of this product may pose to other animals that produce chitin (i.e., crustaceans), it is only for use in freshwater facilities as part of its conditions of use and should therefore not be released into the environment
- Resistance issues have not been described for Lufenuron use in small animals, and is rarely described in agricultural-use. It's efficacy is also reported to be much higher than other sea lice treatment options.
- Tissue residues are not detected 3 months following treatment, and since fish are grown at sea for up to 22 months following treatment, it is considered unlikely that residues will have any relevant impact on the receiving environment.

Sources:

- McHenry JG. 2016. Lufenuron for salmonids: Environmental assessment in support of an import tolerance request (USA). Accessed: <https://www.fda.gov/downloads/AnimalVeterinary/Products/ImportExports/UCM521844.pdf>
- Poley JD et al., 2018. High level efficacy of lufenuron against sea lice (*Lepeophtheirus salmonis*) linked to rapid impact on moulting processes. International Journal for Parasitology: Drugs and Drug Resistance, 8(2):174-188.

Let me know if I can provide any further information,

Dr. Sarah McConnachie MSc, PhD, DVM

Field Operations Veterinarian - Pacific Region
 Fisheries and Oceans Canada | Pêches et Océans Canada
 Aquaculture Environmental Operations - Fish Health
 Courtenay, British Columbia
 Telephone | Téléphone: 250-703-0929
 Cell Phone | Téléphone Portable: [REDACTED]
 Fax | Télécopieur: 250-703-0921
Sarah.McConnachie@dfo-mpo.gc.ca



Government
of Canada

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du Canada

Canada

From: Rainer, Michelle
Sent: April-01-19 11:09 AM
To: Paylor, Adrienne; McConnachie, Sarah; Waddington, Zac
Subject: RE: Sea Lice form letter

Hi Adrienne,
 Sarah is providing info for the lines so I think we're good. I'll send on to you once we have a draft.
 Thanks,
 Michelle

From: Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>
Sent: April-01-19 11:05 AM
To: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>; Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>;
 Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Subject: Re: Sea Lice form letter

Is Howie back? Maybe he can help?

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: McConnachie, Sarah

Sent: Monday, April 1, 2019 1:47 PM
To: Rainer, Michelle; Waddington, Zac
Cc: Paylor, Adrienne
Subject: RE: Sea Lice form letter

Hi Michelle,

Zac is currently in-transit to Ottawa so is unavailable to immediately comment. I've never provided media lines (started 6 mo ago), so let me know if there is a specific formula to follow.

Maybe we could chat on the phone if that's easier – call me at 250-703-0929

Sarah

From: Rainer, Michelle
Sent: April-01-19 8:36 AM
To: Waddington, Zac; McConnachie, Sarah
Cc: Paylor, Adrienne
Subject: FW: Sea Lice form letter
Importance: High

Hi Zac and Sarah,

Is one of you available to help with this today? In addition the media request, there is now a petition on this issue. We will need lines ASAP.

Thanks,
Michelle


From: Anderson, Laura <Laura.Anderson@dfo-mpo.gc.ca>
Sent: March-31-19 8:19 AM
To: pac.prmc / pac.urpcm (DFO/MPO) <XPAC.PRMCU@dfo-mpo.gc.ca>
Cc: Girouard, Louise <Louise.Girouard@dfo-mpo.gc.ca>; Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Subject: Sea Lice form letter

Hello,

New-to-me letter to the Minister shared on social media through the Aqua groups; media requests may come in on the portion of the facebook post highlighted below.

<https://salmonpeople.ca/salmon-lice-epidemic-action?fbclid=IwAR3SVW-6ry4bDHPJzpyPHMnVmBeLTgRCi8lgzmMGTzySNRMmqiqXpJ1Lqq0>

Breaking! Please take action today

Salmon farming giant Cermaq has a sea lice epidemic on their salmon farms in the Clayoquot Sound UNESCO Biosphere Region. They recently obtained an Emergency Drug Release to conduct the first field trial in BC of the insecticide Lufenuron. 

#SilentSpringoftheSea #SalmonPeople
[Jonathan Wilkinson](#) [Justin Trudeau](#)

<https://salmonpeople.ca/salmon-lice-epidemic-action>

It's time to demand that Fisheries Minister Jonathan Wilkinson take a stand for wild salmon. **He needs to to stop approving toxic chemicals for use on open-net pen salmon farms**, and order a harvest of sea lice-infested farmed salmon immediately, before they can harm juvenile wild salmon currently migrating out from rivers into the ocean.

Show Minister Wilkinson that you care! Please send your letter today—feel free to personalise it to have even more impact.

Email will be sent to:

- Jonathan Wilkinson – Minister of Fisheries, Oceans, and the Canadian Coast Guard and MP for North Vancouver
- Justin Trudeau – Prime Minister of Canada and MP for Papineau
- Mel Arnold – Conservative Fisheries Critic and MP for North Okanagan—Shuswap
- Gord Johns – NDP Fisheries Critic and MP for Courtenay—Alberni
- Elizabeth May – Green Party Leader and MP for Saanich—Gulf Islands

Stop approving toxic sea lice chemicals on Clayoquot Sound salmon farms

Dear [recipient name will go here],

The Clayoquot Sound UNESCO Biosphere Region is the largest intact rainforest ecosystem left on Vancouver Island. It is not the place to field trial dangerous drugs. Despite abundant pristine habitat, salmon populations near Tofino are collapsing.

I am petitioning you to stop approving toxic chemicals for use on open-net pen salmon farms, and order a harvest of sea lice-infested farmed salmon immediately, before they can harm juvenile wild salmon currently migrating out from rivers into the ocean.

Sincerely,

[your name will go here]

[your location will go here]

Team-Lead, Digital Communications
Fisheries and Oceans Canada/Government of Canada
Laura.Anderson@dfo-mpo.gc.ca /Tel: 604-666-0392

Chef d'équipe, Communications numériques
Pêches et Océans Canada/Gouvernement du Canada
Laura.Anderson@dfo-mpo.gc.ca / Tél. 604-666-0392

[illegible]

[illegible]

While abundance dropped, there was no release, and the count decreased 1 month following

Use numbers went back up again very quickly

Use numbers went back up again very quickly

Use numbers went back up again very quickly, lake

Reduced efficacy interpreted as increased biomass, no

Recovery data on file

post counts 3 months after

post counts 1 month after

low mobile counts but chains were greatly reduced

Recovery efficacy interpreted as increased biomass, no

Recovery data on file

post counts 3 months after

post counts 1 month after

low mobile counts but chains were greatly reduced

Recovery efficacy interpreted as increased biomass, no

Recovery data on file

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post counts 1 month after

low mobile counts but chains were greatly reduced

Recovery efficacy interpreted as increased biomass, no

Recovery data on file

s.20(1)(b)

[illegible]

[illegible]

s.20(1)(b)

Maley, Shelley

From: Waddington, Zac
Sent: February-12-19 8:11 AM
To: Metcalf, Vanessa
Subject: Re: Is Courtenay open?

Yeah excellent point. I'll definitely change that. And perhaps we can allow the exceeded count to be used given that it's only 30 days....I just don't want to be seen to be loosening the rules. But practically speaking they would never be much over 3 for their first count over.

Zac

----- Original message -----

From: "Metcalf, Vanessa" <Vanessa.Metcalf@dfo-mpo.gc.ca>
Date: 2019-02-12 8:01 AM (GMT-08:00)
To: "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
Subject: RE: Is Courtenay open?

Right. Maybe just having the temporary threshold use the exceeded per fish count?

Also, maybe in section 6.9 you could add

6.2 Any bioassay demonstrating resistance to a drug or parasiticide (need definition), must be reported to the Department within 48 hours of discovery, and no drug or parasiticide-based sea lice management action may be taken without prior approval from the Department

That way we wouldn't be delaying a potential cull/mechanical treatment that could be used to quickly reduce numbers?

Vanessa Metcalf

Aquaculture Management Coordinator | Coordonnatrice de la gestion de l'aquaculture
Aquaculture Management Division | Division de la gestion de l'aquaculture
Fisheries and Oceans Canada | Pêche et Océans Canada
250-754-0405

From: Waddington, Zac
Sent: February-12-19 7:54 AM
To: Metcalf, Vanessa
Subject: Re: Is Courtenay open?

Yes exactly. I need to figure that out. Cause I don't necessarily want them to be allowed over the threshold...but
Ideas are welcome,

Zac

s.21(1)(a)

s.21(1)(b)

----- Original message -----

From: "Metcalf, Vanessa" <Vanessa.Metcalf@dfo-mpo.gc.ca>
Date: 2019-02-12 7:52 AM (GMT-08:00)
To: "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
Subject: RE: Is Courtenay open?

All good. I'll work from home.

I'm just looking at the sea lice changes. I wonder if the temporary sea lice threshold should use the actual per fish sea lice count?

If a farm had a count of 3.5, and they used the assumed 3 per fish, they would already exceed the temporary threshold.

Vanessa Metcalf

Aquaculture Management Coordinator | Coordonnatrice de la gestion de l'aquaculture
Aquaculture Management Division | Division de la gestion de l'aquaculture
Fisheries and Oceans Canada | Pêche et Océans Canada
250-754-0405

From: Waddington, Zac
Sent: February-12-19 7:49 AM
To: Metcalf, Vanessa
Subject: Re: Is Courtenay open?

Adrienne has advised that we all stay home and work from home. So that's what I'm going to do today. I can ask Howie if he's going in.

Zac

----- Original message -----

From: "Metcalf, Vanessa" <Vanessa.Metcalf@dfo-mpo.gc.ca>
Date: 2019-02-12 7:31 AM (GMT-08:00)
To: "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
Subject: Is Courtenay open?

Have you heard if the Courtenay office is open?

Vanessa Metcalf

Aquaculture Management Coordinator | Coordonnatrice de la gestion de l'aquaculture
Aquaculture Management Division | Division de la gestion de l'aquaculture
Fisheries and Oceans Canada | Pêche et Océans Canada
Government of Canada | Gouvernement du Canada
Telephone | 250-754-0405
Facsimile | Télécopieur 250-754-0391

Maley, Shelley

From: Waddington, Zac
Sent: February-12-19 11:00 AM
To: Sandberg, Krista; McConnachie, Sarah
Subject: RE: Discussion - anti-lice treatment reporting

[REDACTED] Thanks very much for the willingness to tackle the reworking of the data to parse out Pacific's and Atlantic's. And any graphical representation of peroxide use would be excellent. We may be presenting something regarding sea lice resistance at the PARR meetings at the end of the month, and having some more visuals would be very welcome.

Zac

From: Sandberg, Krista
Sent: February-12-19 9:08 AM
To: McConnachie, Sarah; Waddington, Zac
Subject: RE: Discussion - anti-lice treatment reporting

Thanks to you both for your input 😊

I'm happy that you agree with removing the Pacifics, though you are correct that it won't change much in recent years. When the province originally created this graph, I think that they were trying to promote the aquaculture industry and were using the lens of "this is how much is used for all the fish you eat" [REDACTED]

I think I will calculate out the H2O2 and maybe add it on a graph for my annual managers report, to show the trend in treatment choices and this should also help us decide if we want to publically report this way. Once we have better lice treatment info after licence condition changes we may want to revisit this – maybe a graph showing the number of the various treatment types.

As for the production cycle analysis, I'm not prepared to tackle this again at this point as I've got a lot on my plate, but maybe something our epi can help with? Or maybe one day I will have some time to look closer. It's been a few years since I looked at it, and I think I've got a better handle on the data now so it may not be as complicated as I previously thought 😊

[REDACTED]

Krista.

s.16(2)(c)

s.19(1)

s.21(1)(b)

Krista Sandberg
Public Reporting Manager | Gestionnaire de rapports publics
Office | Bureau 250-286-5835
Cellular | Cellulaire [REDACTED]



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du Canada

Canada

From: McConnachie, Sarah
Sent: February-11-19 4:15 PM
To: Waddington, Zac
Cc: Sandberg, Krista
Subject: Re: Discussion - anti-lice treatment reporting

I agree that Pacifics should be removed from the equation - it doesn't accurately represent the usage.

What Zac said about reporting hydrogen peroxide! But eventually it would be interesting to see where and when it's use has been increasing.

I think it would be interesting to separate by production cycle - especially since lice infestation increases over time at sea, so there may be some undetected variability among years due to fish being in various stages of the cycle. As long as you could find a way to make it less messy! I feel your pain - especially since you have to start accounting for smolt sites etc.

On Feb 11, 2019, at 3:32 PM, Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca> wrote:

I think that even though SLICE is often used on fish which are not harvested in the same calendar year (and vice versa), so long as we are reporting a large dataset with multiple years, this should be fine since it will be captured in the adjacent years. The larger trends would still be valid for the interest of the public. I think that given the change in production with more and more production being shifted towards Atlantics, it might be worth looking at the historic dataset, and see if we can't correct the y axis to be "grams of active drug/tonne of Atlantic salmon produced." Would this be possible Krista?

As for peroxide and other non-drug lice treatments, I might suggest holding off on reporting anything for the time being.



Just my thoughts,

Zac

s.21(1)(a)

s.21(1)(b)

From: Sandberg, Krista
Sent: February-11-19 3:25 PM
To: Waddington, Zac; McConnachie, Sarah
Subject: Discussion - anti-lice treatment reporting

Hi Zarah,

I'm not sure if you're familiar with the graph below, but it's something that we create annually and it includes data back to the Provincial days. We use the AASR data to get production information and relate that to how much Slice was used in a given year. I have a few issues with this graph, and I'm wondering if you want to weigh in now that we have fresh minds to look at this.

1. We use production of both Pacific and Atlantic salmon to determine grams drug/tonne of salmon – even though sea lice drugs are not used for Pacifics
2. It's not completely fair to use the harvested biomass to compare to Slice used because some of the Slice might be used on fish that were not actually harvested in that year, and vice versa – I tried to link this to production cycle in the past but it just got very messy.
3. What are your thoughts on adding H2O2 to this graph? I know it currently says in-feed therapeutants but perhaps we could change the title? It would be interesting to see if Slice use decreases with the introduction of bath treatments. I'm not sure how we could display mechanical treatments however...

<image001.png>

Krista Sandberg

Public Reporting Manager | Gestionnaire de rapports publics
Aquaculture Management Division | Gestion de l'aquaculture
Fisheries and Oceans Canada | Pêches et Océans Canada
krista.sandberg@dfo-mpo.gc.ca

Office | Bureau 250-286-5835

Cellular | Cellulaire [REDACTED]

s.16(2)(c)

<image002.png>

No further information has been removed or severed from this page

Maley, Shelley

From: McCorquodale, Brenda
Sent: February-12-19 3:45 PM
To: Webb, Allison; Paylor, Adrienne; Patirana, Anoma
Cc: Shaw, Kerra; Waddington, Zac; Taekema, Bernie John
Subject: FW: meet again?
Attachments: Letter to Brenda McCorquodale re 2019 mgmt.docx

Hello all

We have received a letter from the environmental organizations' Conservation Regulatory Working Group requesting a meeting on a couple of specific issues, including: sea lice management, prv, and licenced production limits. Can please you take a look at the attached and we will want to start drafting our response to these items. We can discuss at the next Manager's meeting the time frame for setting up a discussion with the CRWG.

Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des peches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

From: Karen Wristen [REDACTED]
Sent: Tuesday, February 12, 2019 3:16 PM
To: McCorquodale, Brenda
Subject: meet again?

Dear Brenda,

Please see our attached letter proposing another meeting with the Conservation Regulatory Working Group.

Regards,
Karen

Karen G. Wristen
Executive Director
Living Oceans Society
Suite 7, 650 Clyde Avenue
West Vancouver BC V7T 1E2
Ph: 604-696-5044
Fax: 604-696-5045
Cell: [REDACTED]

s.19(1)

www.livingoceans.org

Skype:



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s.19(1)



February 12, 2019

Ms. Brenda McCorquodale
Senior Aquaculture Management Coordinator
8585 Wollason Street
Nanaimo, British Columbia V0N 2P0
Canada
P.O. Box 10

Dear Brenda,

It has been some time since we have met to discuss issues of concern with aquaculture management and we find that there are a few things we would like to discuss—one of them most urgently, and before the next juvenile salmon outmigration.

Sea lice management

The news that we have now seen confirmed cases of SLICE-resistant lice in Klemtu and on the WCVI has been cause for great concern, particularly as we also note that the resistant genotype has been found in lice sampled from wild Pacific salmon. As noted by the authors of that paper¹, “a small number of hosts could rapidly spread resistant lice from a local to oceanic scale through host mixing in common feeding grounds (Besnier et al., 2014; Jacobsen et al., 2012)”.

The rapid spread of resistance down the WCVI from Esperanza in 2017 to Clayoquot in 2018 would suggest that an extremely precautionary approach to lice management is required in 2019. This would include ensuring that alternate treatments are readily available and that total area abundance of salmon lice is managed, rather than just on-farm lice-per-fish. We note as well that gill disease, which we understand is posing an increasing challenge for the industry, may counter-indicate the use of hydrogen peroxide baths; and that the Province has yet to undertake a risk assessment for the use of azamethiphos, a process that could take 4-6 months from the date of the first application to use it.

¹ Messmer, A. et al, “A 200K SNP chip reveals a novel Pacific salmon louse genotype linked to differential efficacy of emamectin benzoate” Marine Genomics 40 (2018), 45-57

All of this, coupled with the fact that no mechanical cleaners (Hydrolicers) are expected to be available in B.C. until later in 2019, leaves us with an understandable concern that there will be a gap in available and effective treatment for sea lice during the 2019 outmigration.

We wish to discuss with you the changes in management approach that will be taken to ensure the health of wild juvenile salmonids outmigrating in 2019.

Licensed Farm Biomass

We have noted a couple of instances of farms producing more than the licensed biomass per production cycle; and at the same time, farms applying for additional cages and/or larger or different arrays without a request for increased licensed biomass. We assume that this is the result of an interpretation of the meaning of the biomass limits in the Conditions of Licence—i.e., that so long as the farm does not exceed the licensed biomass at any given time, it is free to produce more than the licensed biomass during the production cycle.

This gives rise to some concerns for the potential impact on the marine environment and the way it is being monitored.

1) Modeling and site selection

Site selection and approval was based in part on Depo-Mod modeling of potential benthic impacts and at the time these sites were established, an exceedance of the licensed biomass during a production cycle was not contemplated. Have the farms been required to conduct additional modeling to estimate the impacts of the additional biomass over the period of a single grow-out cycle?

2) Peak biomass monitoring

It is apparent from the foregoing that “peak biomass” is now a state that may pertain for a period of months during the production cycle, rather than the point immediately before harvest. Conditions of licence require benthic sampling at peak biomass and the ability to restock the farm is dependent upon the result of this sampling. Our question about this is, when is the sample to be taken? The implications for ecosystem health might be quite different for a sample taken when the farm first reaches its licensed biomass, as opposed to one taken at the end of the grow-out cycle.

We would be interested to know how this additional production is being regulated and what safeguards for benthic health and water quality are being applied.

PRV and the Federal Court decision

Given the ruling of the Federal Court striking down the Minister’s policy with respect to PRV testing and the recent announcement by CSAS that their risk assessment (with regard only to Fraser River sockeye) suffers from uncertainty as a result of the paucity of studies assessing impacts to sockeye, what will be the management approach to dealing with PRV-infected

smolts? The answer to this question should be of considerable interest to the Province as well, as it deals with the regulation of processing plant and hatchery effluents.

We propose a meeting and suggest that inviting a representative from the Province might be a useful idea, so that all interested parties might share views on management going forward.

We look forward to hearing from you,

Sincerely,



Karen G. Wristen
Executive Director, Living Oceans Society
On behalf of:

 David Suzuki Foundation

 Watershed Watch Salmon Society

 Georgia Strait Alliance

s.19(1)



February 12, 2019

Ms. Brenda McCorquodale
Senior Aquaculture Management Coordinator
8585 Wollason Street
Nanaimo, British Columbia VON 2P0
Canada
P.O. Box 10

Dear Brenda,

It has been some time since we have met to discuss issues of concern with aquaculture management and we find that there are a few things we would like to discuss—one of them most urgently, and before the next juvenile salmon outmigration.

Sea lice management

The news that we have now seen confirmed cases of SLICE-resistant lice in Klemtu and on the WCVI has been cause for great concern, particularly as we also note that the resistant genotype has been found in lice sampled from wild Pacific salmon. As noted by the authors of that paper¹, “a small number of hosts could rapidly spread resistant lice from a local to oceanic scale through host mixing in common feeding grounds (Besnier et al., 2014; Jacobsen et al., 2012)”.

The rapid spread of resistance down the WCVI from Esperanza in 2017 to Clayoquot in 2018 would suggest that an extremely precautionary approach to lice management is required in 2019. This would include ensuring that alternate treatments are readily available and that total area abundance of salmon lice is managed, rather than just on-farm lice-per-fish. We note as well that gill disease, which we understand is posing an increasing challenge for the industry, may counter-indicate the use of hydrogen peroxide baths; and that the Province has yet to undertake a risk assessment for the use of azamethiphos, a process that could take 4-6 months from the date of the first application to use it.

Zac's Response:

Comment [ZW1]: I am not aware of any intention of industry to use this product in BC. This would need to be licenced under an Emergency Drug Release which I am always made aware of

¹ Messmer, A. et al, “A 200K SNP chip reveals a novel Pacific salmon louse genotype linked to differential efficacy of emamectin benzoate” Marine Genomics 40 (2018), 45-57

They are misrepresenting the article with the above quote. In fact, the authors state "Frequent migration of lice among farmed and wild hosts should limit the effect of farm-specific selection pressures [SLICE resistance] on changes to the overall allele frequencies of sea lice in the Pacific Ocean." The allele they are referring to is a naturally occurring SLICE resistant genotype which the authors believe to be "a rare genotype present in Pacific lice," which "may be locally expanded in farms after EMB treatment." This sentiment is reiterated throughout the article. The quote they reference is actually speaking solely about the Atlantic sea lice population and the states "A reduced number of wild hosts in the Atlantic could, however, limit the degree to which incoming lice can dilute out a selectively advantageous mutation, even as a small number of hosts could rapidly spread resistant lice from a local to oceanic scale through host mixing in common feeding grounds (Besnier et al., 2014; Jacobsen et al., 2012)." The very next sentence states, "It could be hypothesized that dilution by large numbers of naïve lice from returning hosts could inhibit the establishment and spread of any such advantageous mutation should it emerge in the Pacific."

There is no evidence or reason to believe that resistant sea lice are "spreading" down the west coast of Vancouver Island. The current evidence is that the small sub-population of lice with a naturally occurring resistance to SLICE is selected for and becomes dominant in a farm or farming area when SLICE is used repeatedly. The article they misrepresent nicely explains this.

I am not sure why they are referring to azamethiphos since I am not aware of any intention of industry to use this product in BC. This would need to be licenced under an Emergency Drug Release which I am always made aware of.

All of this, coupled with the fact that no mechanical cleaners (Hydrolicers) are expected to be available in B.C. until later in 2019, leaves us with an understandable concern that there will be a gap in available and effective treatment for sea lice during the 2019 outmigration.

We are currently in discussions with Cermaq to ensure that they are aware of, and meet our licence conditions. They have submitted a sea lice management plan for three farms which are at or near the three motile threshold as of March 1st,

The remainder of sites in Clayoquot have virtually no lice burden at this time. This is due to improved Area Based Management and the treatment of all smolts entered into Clayoquot since the 2018 outmigration with the drug Imvixa in the hatchery. This drug confers 6-9 months of sea lice resistance to treated fish.

We wish to discuss with you the changes in management approach that will be taken to ensure the health of wild juvenile salmonids outmigrating in 2019.

Licensed Farm Biomass

s.20(1)(b)

s.21(1)(b)

We have noted a couple of instances of farms producing more than the licensed biomass per production cycle; and at the same time, farms applying for additional cages and/or larger or different arrays without a request for increased licensed biomass. We assume that this is the result of an interpretation of the meaning of the biomass limits in the Conditions of Licence—i.e., that so long as the farm does not exceed the licensed biomass at any given time, it is free to produce more than the licensed biomass during the production cycle.

KERRA'S RESPONSE:

Although the provincial government used to licence total production taken off the farm, DFO does not licence in this way. We licence peak biomass, which is the maximum amount of standing tonnage on a farm during a production cycle, because this is the time of greatest environmental impact. DFO and industry interpret this in the same way; sites are "allowed" to harvest more off of the farm than is on the face of their licence, as long as they do not exceed their peak biomass at any time during a production cycle. DFO has licenced and defined tonnage in this same way when Section 35(2) Authorizations were issued under the Fisheries Act from 2003-2010, and then through licence conditions from 2010 onwards.

Yes, there is an increasing trend of adding cages to arrays without tonnage increases. This occurs because decreasing fish stocking and growing densities and adding more ability for water flow has been demonstrated to increase fish health and growth rates. It also decreases the intensity of organic loading on the seabed, which helps with remediation times. Obviously, this is beneficial for both farmers and the environment, so is therefore supported by DFO. Tonnage over time has not dramatically increased due to these changes – please see graph below.

This gives rise to some concerns for the potential impact on the marine environment and the way it is being monitored.

1) *Modeling and site selection*

Site selection and approval was based in part on Depo-Mod modeling of potential benthic impacts and at the time these sites were established, an exceedance of the licensed biomass during a production cycle was not contemplated. Have the farms been required to conduct additional modeling to estimate the impacts of the additional biomass over the period of a single grow-out cycle?

KERRA'S RESPONSE:

Since initiating the use of DEPOMOD in BC, the metric of peak biomass has always been used as an input, which aligns with how DFO licences tonnage, and we have never used the metric of the total production taken off the site. We enter the greatest standing tonnage expected (the peak biomass) which aligns with greatest feed rates to predict the worst case scenario impact on the seabed. This continues to be used in siting decisions to understand where and how impacts are expected to occur. DFO has always acknowledged and known that sites can harvest more tonnage from a farm than the tonnage on the face of their licence, and we do not interpret this to be an exceedance or a violation of any kind, as it is a different metric than what is licenced. There has been no change in this management approach since 2003, and as this

model already uses peak biomass, there is no additional modelling required to understand how impact occurs. Monitoring over time has continued to demonstrate that peak biomass is a more relevant predictor of benthic impact than total production harvested.

2) *Peak biomass monitoring*

It is apparent from the foregoing that “peak biomass” is now a state that may pertain for a period of months during the production cycle, rather than the point immediately before harvest. Conditions of licence require benthic sampling at peak biomass and the ability to restock the farm is dependent upon the result of this sampling. Our question about this is, when is the sample to be taken? The implications for ecosystem health might be quite different for a sample taken when the farm first reaches its licensed biomass, as opposed to one taken at the end of the grow-out cycle.

KERRA'S RESPONSE:

Yes, peak biomass has always been able to be sustained for weeks to months, rather than a single moment in time. In recent years, companies have been prolonging harvest for a longer time than used to occur. In part, this is because companies used to more regularly “grade” fish during production cycles while they rarely do this now to avoid unnecessary handling. Now they harvest the biggest fish out of a pen first, and leave smaller fish behind while they begin to harvest in the next pen, allowing them a few more months to grow which adds time to the overall harvest. Additionally, this can allow a company to provide fish to markets 365 days a year because harvests are occurring almost constantly at least one at of their farms. And finally, with very few new sites being added in recent years, companies are trying to optimize the amount of fish they can harvest from sites while still meeting environmental thresholds, such as sea lice and benthic impacts.

Although peak biomass can be prolonged, there is always a single day that is the actual peak. As has been the case since 2002, licence holders must monitor the sea bed within 30 days either side of that date. If they monitor once around that date but hold fish long enough that a second larger peak is reached, they must monitor again to be in compliance with the Aquaculture Activities Regulations. Over time, we have not seen benthic impacts increasing; we have actually seen them decreasing. This is due to many factors such as new feeds with better digestibility and food conversion rates, more monitoring to reduce waste of feed, moving sites deeper offshore, and adding extra cages (as above) without adding more tonnage. This allows waste impacts to be less intense on the seabed, which allows faster remediation. We do not see slow cumulative creep of farm footprints over time; we see 80-90% of sites stocking production cycle after production cycle while still staying under set environmental thresholds, which aligns with our sustainability objectives. Monitoring over time has continued to demonstrate that peak biomass is a more relevant predictor of benthic impact than total production harvested.

We would be interested to know how this additional production is being regulated and what safeguards for benthic health and water quality are being applied.

KERRA'S RESPONSE:

We continue to licence peak biomass and have industry monitor within 30 days of that window. Additionally, DFO staff field audit benthic performance at >20% of active farms every year. Our data aligns very well with industry results, and we post this information on our website. Total harvested production has often exceeded peak biomass production over the time DFO has been using this metric for management, so there is no extra regulation being considered to manage it now. Benthic health is always a priority for the Department, and sites have been continuing to improve their performance over time. At this time, water quality is not being measured because research conducted in the early 2000s indicated that impacts could not be detected very far from cage edges. However, some new work is being conducted through a national DFO initiative called the Aquaculture Monitoring Program and water quality testing will likely be initiated this year to look at determine if this is still correct.

PRV and the Federal Court decision

Given the ruling of the Federal Court striking down the Minister's policy with respect to PRV testing and the recent announcement by CSAS that their risk assessment (with regard only to Fraser River sockeye) suffers from uncertainty as a result of the paucity of studies assessing impacts to sockeye, what will be the management approach to dealing with PRV-infected smolts? The answer to this question should be of considerable interest to the Province as well, as it deals with the regulation of processing plant and hatchery effluents.

I am not aware of what our approach will be to PRV testing. However, the PRV CSAS found a minimal risk posed to Sockeye in the discovery islands and the court decision did not dictate testing, but allowed the minister discretion. Further, virtually all smolts stocked by industry into marine sites are free of PRV. This evidence was presented at the PRV CSAS which [REDACTED] (a signatory on this document) was present for.

We propose a meeting and suggest that inviting a representative from the Province might be a useful idea, so that all interested parties might share views on management going forward.

We look forward to hearing from you,

Sincerely,

[REDACTED]

Karen G. Wristen
Executive Director, Living Oceans Society
On behalf of:

[REDACTED] David Suzuki Foundation

[REDACTED] Watershed Watch Salmon Society



Georgia Strait Alliance

s.19(1)

No further information has been removed or severed from this page

Maley, Shelley

From: Waddington, Zac
Sent: February-15-19 12:13 PM
To: Andrew Bateman
Subject: RE: SLICE resistance

Sounds great. I'll keep you posted as this goes along. And hopefully we can get some interesting analyses done. This is quite a unique circumstance and a great opportunity to get some research done to better understand things.

Zac

From: Andrew Bateman [REDACTED]
Sent: February-15-19 11:23 AM
To: Waddington, Zac
Subject: Re: SLICE resistance

Thanks Zac,
I got in touch with [REDACTED] who basically just suggested to contact the various leads from the companies. All things considered, it sounds like the fastest/easiest approach will likely be to wait until your team is staffed & up-and-running.
I'll look forward to chatting when you/Sarah/Derek are ready.
-Andrew

On Mon, 11 Feb 2019 at 14:21, Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca> wrote:

We all work for AMD (Aquaculture Management Division) which is in a separate branch of DFO from the DFO Science folks housed at PBS. So we all work out of an office in Courtenay. That said, we are down at PBS a fair bit, and I hope even more in the future as I'm really trying to build more collaborations with the folks there.

I don't think there's anything wrong with you reaching out to [REDACTED] directly. You can tell him that I gave you his email which is [REDACTED] so he might be happy to do some work with you guys.

Best of luck,

Zac

s.19(1)

From: Andrew Bateman [REDACTED]
Sent: February-11-19 1:38 PM
To: Waddington, Zac
Subject: Re: SLICE resistance

Thanks Zac.

It would be great to touch base with Sarah and Derek, once he starts, and of course yourself. Are you all normally based at PBS? I'll mention this to Ben Sutherland (in molecular genetics) next time I see him. It sounds like there could be a really nice opportunity here.

Regarding the Cermaq vet, would it be appropriate for you to (electronically) introduce me?

Thanks,

-AB

On Sat, 9 Feb 2019 at 15:40, Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca> wrote:

Thanks for your note. And yes I agree that it was excellent to meet up and have a chance to chat. I am certainly interested in working collaboratively to help address some of these thorny questions. As I said when we chatted, we have so much data and would we are happy to share it within DFO to make the best use of it. We have an epidemiologist joining our team in March, and our other vet Sarah McConnachie has a pathology PhD and so the two of them are excellent resources that I am hoping to utilize to better make use of our data and start getting some publications out. We have any existing epi project which is in its infancy that I am hoping Derek (our new epi) can pick up when he arrives. Unfortunately we do not have any lice samples to conduct an genetic analysis on, but I would be very keen to integrate that analysis into the project if feasible. Once we have a chance to bring Derek up to speed I'd be keen to see what he thinks.

Unfortunately I do not know any more about the genetic basis of the other resistance episodes we've had. However, the vet for Cermaq at the time, [REDACTED] would know the most about the most recent Clayoquot resistance outbreak, and he would be worth reaching out to. Do you have his contact info?

I would be happy to review your manuscript, and if I can think of some data we have to contribute I'd be happy to offer that as well.

Look forward to working together,

s.19(1)

Zac

From: Andrew Bateman [REDACTED]
Sent: February-08-19 12:17 PM
To: Waddington, Zac
Subject: SLICE resistance

Zac,

Nice to meet you in-person on Wednesday.

It would be very interesting to coordinate some work on SLICE resistance, possibly evaluating the effect of treatment and resistance-mitigation measures in near-real-time. I'd like to try and arrange to meet with Ben Sutherland (DFO), you, and Kristi, if you think there's scope to collaborate on this. I haven't run things by them in detail, and I'm not sure if there are tricky internal politics involved, but I thought I'd check to see if you're interested in principle.

On another note, I may have mentioned that I'm in the process of writing up some theoretical work on resistance evolution (a holdover from one of my postdocs). I'd like to accurately portray the recent instances of resistance in BC. I know there's the paper from 2018 about resistance ("reduced sensitivity") in Kitasoo/Xai'Xais territory. I wonder if you know of any details of the other events you spoke about on Wednesday, that would be appropriate to cite in a journal article.

I want to add that I was impressed by your use of the current scientific literature in your approach to resistance management. From my perspective, it would be really nice to share information as much as possible (obviously there are issues that hinder that, such as any possible court action). As I'm sure you're aware, there has been a good deal of animosity over the years on the fish-farm - and especially on the sea-louse - file(s), but I'd like to think that open communication and a scientific approach (on all sides) would lead to the best possible outcome.

If you'd like, I can share my SLICE-resistance manuscript with you for friendly comment before publication. It will be quite theoretical, but may be able to offer some insight, at least in terms of general trends.

Talk soon,

s.19(1)

Andrew

Maley, Shelley

From: Paylor, Adrienne
Sent: February-18-19 2:03 PM
To: McConnachie, Sarah; Waddington, Zac; Patirana, Anoma
Subject: RE: Prep for PARR meetings
Attachments: Pac AMD PARR and Fish Health Priorities Feb 2019.docx.pptx

Follow Up Flag: Follow up
Flag Status: Completed

I have made updates so please work from this version Anoma.
Thx Adrienne

From: McConnachie, Sarah
Sent: February-15-19 5:45 PM
To: Paylor, Adrienne; Waddington, Zac
Cc: Patirana, Anoma
Subject: RE: Prep for PARR meetings

I made changes to slide 4 onward to address the fish health discussion based on the science Qs document as a starting place.

From: Paylor, Adrienne
Sent: February-15-19 2:54 PM
To: Waddington, Zac; McConnachie, Sarah
Cc: Patirana, Anoma
Subject: FW: Prep for PARR meetings

Anoma is starting to work on the priority deck so coordinate with her if you are making changes to the slides.
Thx A

From: Patirana, Anoma
Sent: February-15-19 1:27 PM
To: Paylor, Adrienne; Waddington, Zac; McConnachie, Sarah; Shaw, Kerra
Subject: RE: Prep for PARR meetings

Hey Adrienne, I assume AEO is doing a first cut of the decks and will circulate for addition of the high-level information? Also can you send me the agenda for the meeting noting which two agenda items the below decks would speak to? It would be helpful for the context. Thanks!
-Anoma

From: Paylor, Adrienne
Sent: February-14-19 4:48 PM
To: Patirana, Anoma; Waddington, Zac; McConnachie, Sarah; Shaw, Kerra
Cc: Webb, Allison; McCorquodale, Brenda
Subject: Prep for PARR meetings

Hi Team,
Allison has asked that we prepare two decks for the National Parr meetings Feb 26th and 27th.
I think we can start with the attached AMD science priorities/ABAM and then shorten and update.

Anoma I think you can help with the high level stuff. Zac & Sarah can you work on the FH science needs and then Kerra and I can look at the AMAM after that. Thx

The first Deck is to focus on context and drivers for our Fish Health research needs and then second deck to highlight science needs for the ABAM & our Pilot:

Allison wanted us to add some pictures and talk about the Ministers recent announcements & BC issues including:

- Recent Audits and recommendations – CESD/AusVet/MAACFA – what did they tell us to do
- The Independent Expert Panel on Aquaculture Science report recommending appropriate use of scientific evidence in risk-based decision-making and establishment of Risk Tolerance levels and Harm triggers for regulatory action
- FARM and Precautionary Approach
- Performance based management
- Innovative Technology Study
- Clarification of roles with CFIA and testing protocols
- Broughton Process
- Morton Namgis Court Case
- Expanding scope of the risk assessments
- Chinook and wild fish impact concerns
- Wild Salmon Policy
- Slice Resistance and IPM
- Etc.

Adrienne Paylor

Regional Manager, Aquaculture Environmental Operations
Fisheries and Oceans Canada / Pêches et Océans Canada
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Government of Canada | Gouvernement du Canada



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Pacific Region Aquaculture Regulatory Science & Fish Health Priorities

PARR Meetings Ottawa
Feb 26th 2018



Luke Laberge, Tokonhemciy, Canada, and other staff

Canada

Context

- Highly contentious regulatory environment regarding salmon aquaculture
 - Significant focus on fish health, PRV/HSMI, etc.
- DFO response to external recommendations
 - Cohen Commission Risk assessments for Fraser sockeye by 2020
 - MAACFA and CESD
- Litigation – s. 56 / duty to consult, ATIPs, Min corro
 - Shining light on debate in science
- Active provincial agenda on salmon
 - June 2018 announcement on aquaculture (“... will not adversely impact salmon stocks”)
 - Wild Salmon Advisory Council
- Managing perceptions of risk vs env’l risks

Context Con't

- The Independent Expert Panel on Aquaculture Science report risk-based decision-making and establishment of Risk Tolerance levels and Harm triggers for regulatory action
- FARM and Precautionary Approach
- Performance based management
- Innovative Technology Study
- Clarification of roles with CFIA and testing protocols
- Broughton Process
- Morton Namgis Court Case
- Expanding scope of the risk assessments
- Chinook and wild fish impact concerns
- Slice Resistance and IPM

Moving Forward

- Increasing capacity in fish health team
 - Vet, epidemiologist for increased analysis of info
 - Precautionary approach framework
 - implementation to identify areas of more than low risk
 - Where there is a lack of certainty in the risk ranking, will help direct science efforts
 - Area based management - Pilot NVI
 - Performance based standards – FHAC ToR
 - More integrated approach to science advice based on risk and linked to PA approach
-

Pacific Region Requests for CSAS Advice heavily influenced by fish health issues.

Aquaculture Science Research Plan on Fish health/Wild Pacific Salmon-Farmed Interactions

Last Year Science Priorities for 2018

1. Risk assessments with respect to the transfer of microbes, pathogens and disease between cultured and wild fish stocks
2. Development of ecosystem based “areas” to facilitate Area Based Management
3. Sea lice management and determination of harm to wild salmon
4. Fallowing as mitigation for disease transmission in farmed fish
5. Characterization of emerging diseases
6. Escape of commercially cultured Chinook salmon and the genetic and ecological risks to, and mitigation for, wild Chinook salmon in British Columbia
7. Modelling and monitoring approach to evaluate ecological carrying capacity for shellfish aquaculture

1. Fish Health / Wild-Farmed Interactions

Fish Health Risk Assessments – Finish DI and Expand Scope to other Areas

Management objective:

- To minimize and mitigate interactions between farmed Atlantic and wild Pacific salmon that result in negative impacts to wild Pacific salmon population sizes
- What is the proportional impact of farmed Atlantic salmon aquaculture on the Pacific Coast to Sockeye salmon mortality and returns (i.e., rate and abundance)?
- Six – complete (5 awaiting publication)
- 10 subsequent risk assessments planned between now and 2020
- Cumulative risk assessment – 2020?

1. Fish Health Risk Assessments cont'd

- Amoebic Gill Disease (AGD) (Paramoeba perurans) • Salmon Rickettsial Septicemia (SRS) (Piscirickettsia salmonis)
- Bacterial Kidney Disease (BKD) (Renibacterium salmoninarum) • Viral Hemorrhagic Septicemia (VHS)
- Enteric redmouth disease (ERD) (Yersinia rucieri) • Winter Ulcers (Moritella viscosa)
- Furunculosis (Aeromonas salmonicida) • Proliferative Gill Inflammation (PGI) (Desmozon lepeophtherii)
- Idiopathic Heart Disease of which the cause is unknown • ***Piscine Reovirus (PRV) / Heart and Skeletal Muscle Inflammation (HSMI)
- Mouth Rot (Tenacibaculum maritimum)

2. Ecosystem Based Areas (Finfish)

Potential indicators/framework for area-based management

- Current management approach based primarily on mitigating potential risks on the farm/site level
- Delineate areas along BC's coast for the purposes of ABM by industry based on hydrology (i.e., FVCOM) and ecosystem features that show connectedness
 - To allow for coordinated stocking, harvest, fallowing, and treatments
- Consider sea lice transmission strength/risk between farms as the basis for determining areas
 - See Cantrell et al., 2018
- Evaluate possible performance measures that indicate a carrying capacity for an area
 - For example: mortality levels, harmful algal blooms, etc.

3. Sea Lice Management

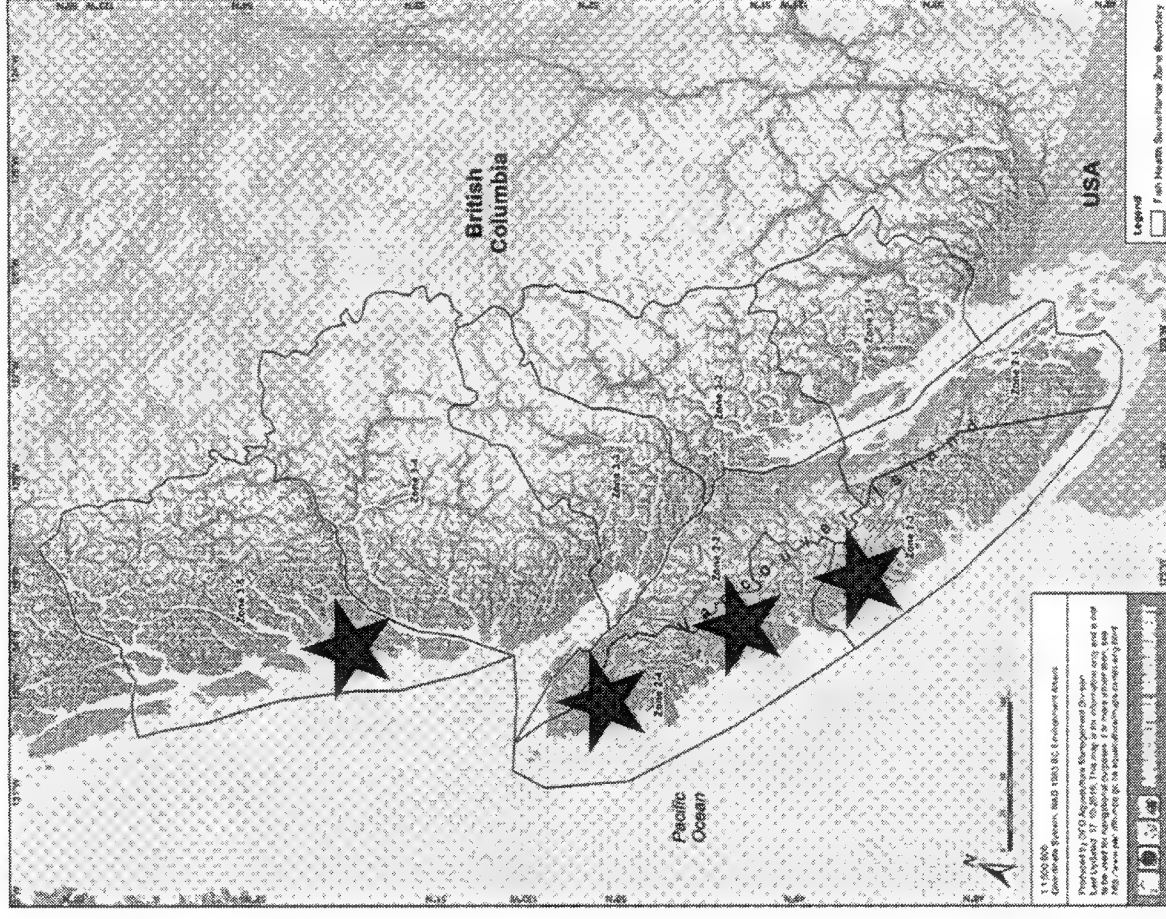
Sea lice management and determination of harm to wild salmon

- Determine the possibility of developing area-specific outmigration periods based on regional spatial and temporal migration patterns of juvenile salmonids
 - Is there sufficient knowledge of stock-specific spatial and temporal juvenile salmon outmigrations currently to inform this decision?
 - If not – further study of juvenile outmigration spatial and temporal distribution would be warranted to inform this regulatory decision
 - Justification → Refined legislation to define outmigration periods that represent variable stock migration may help reduce treatment frequency, and thus reduce the risk of resistance development
- Determine any potential harm resulting from sea lice mismanagement in Clayoquot during the 2018 outmigration period as measured by potentially decreased escapement in the region relative to other regions (or stock units)

3. Sea Lice Con't

Conduct analysis to determine risk factors for SLICE resistance

- North Pacific basin only area of world without widespread SLICE resistance.....
- Resistance emerged in Atlantic in mid-2000's and quickly spread to every salmon farming region
 - Genetic resistance now established in farmed and wild Atlantic salmon populations (no known fitness cost)
 - Do resistant lice persist in areas?
- SLICE (emamectin benzoate) resistance documented in many areas
 - Klemtu- 2013
 - Quatsino- 2014
 - Esperanza- 2016-2017
 - Clayoquot- 2018



4. Fallowing

Fallowing as mitigation for disease transmission in farmed fish

- Would a mandatory fallowing period between production cycles at aquaculture facilities reduce the risk of disease transfer between generations of cultured, and/or wild fish?
 - If so, what minimum fallow period would be useful to mitigate BC farmed salmon disease risk in BC?
- Determine length of fallow necessary to break the disease cycle for each relevant pathogen (e.g., resistant lice)
 - Will help inform possible performance-based fallowing
 - E.g., If 'x' disease was found to be present at the population level in the previous production cycle, a fallow period of 'y' is mandated
- Consider the contribution of wild fish as a reservoir for disease
 - E.g., ID reservoirs and their movements in a given region

5. Emerging Diseases

Characterization of emerging diseases

- Examination of proliferative gill disease (PGD) as an emerging disease in Canada's Pacific watershed
 - What role (if any) do pathogens, husbandry practices, and/or environment play in the etiology of this disease?
 - Comparison of gill health in the hatchery before seawater entry and region-specific changes after transfer
- What is the current distribution of amoeba in BC
 - Possible use of eDNA detection methodology
 - Is it possible /desirable to maintain amoeba-free areas?
 - E.g., Similar to what is currently done in Tasmania
 - Is the genotype of BC's amoeba the same as the current or historical amoeba known to be present in WA state for decades prior, or is this a new introduction?

6. Genetic Risks for Chinook

Escape of commercially cultured Chinook salmon and the genetic/ecological risks-to, and mitigation-for wild Chinook salmon in BC

- Chinook Hybridization Risks
 - What are the genetic and ecological risks to wild Chinook salmon posed by escapement of commercially-cultured Chinook salmon? How might these be mitigated?
 - What is the prevalence of escaped farmed chinook and their hybrids in existing chinook salmon samples off the West Coast of Vancouver Island?
 - What is the magnitude of the hybridization of farmed-wild chinook relative to SEP-wild Chinook hybrids

7. Shellfish

Modelling and monitoring approaches to evaluate the ecological carrying capacity for shellfish aquaculture

- Develop monitoring and modelling methodologies to determine potential impacts of new or modified existing shellfish aquaculture applications on the ecological carrying capacity of a specific area
- E.g., Baynes Sound Integrated Oceans Management Plan

Maley, Shelley

From: McConnachie, Sarah
Sent: February-21-19 11:12 AM
To: 'White, Kirsten M ENV:EX'
Cc: Doll, Andrea ENV:EX; Moores, Karen ENV:EX; Epps, Deb ENV:EX; Barlak, Rosie ENV:EX
Subject: RE: ENV-DFO discussion on fish pathogens
Attachments: MOE Wastewater discussion-ZW.docx

Hi Kirsten,

Zac wanted to add some edits - see the note about SRS in the first section, an added point about sea lice management (resistance issue), and the bioassay requirements for PRV in the 2nd section.

Sarah

From: White, Kirsten M ENV:EX [mailto:Kirsten.White@gov.bc.ca]
Sent: February-20-19 1:08 PM
To: McConnachie, Sarah
Cc: Doll, Andrea ENV:EX; Moores, Karen ENV:EX; Epps, Deb ENV:EX; Barlak, Rosie ENV:EX
Subject: RE: ENV-DFO discussion on fish pathogens

Thank you very much for your time and efforts in preparing this thorough response Sarah. It is greatly appreciated. We will let you know if we have any further questions or need for clarification.

Kind regards,
Kirsten

Kirsten White, B.Sc., P.Ag.
Authorizations Section Head
Authorizations - South
Ministry of Environment and Climate Change Strategy
phone: (250) 751-3193
email: Kirsten.White@gov.bc.ca
[Waste Discharge Authorizations Website](#)

24hr Spill/Environmental Emergency Reporting: 1-800-663-3456
24hr RAPP-line (Report All Poachers and Polluters): 1-877-952-7277

From: McConnachie, Sarah [mailto:Sarah.Mcconnachie@dfo-mpo.gc.ca]
Sent: Wednesday, February 20, 2019 12:05 PM
To: White, Kirsten M ENV:EX
Cc: Doll, Andrea ENV:EX; Moores, Karen ENV:EX; Epps, Deb ENV:EX; Barlak, Rosie ENV:EX
Subject: RE: ENV-DFO discussion on fish pathogens

See attached for my discussion relating to the questions you posed. Let me know if you require further clarification.

Dr. Sarah McConnachie MSc, PhD, DVM
Field Operations Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia
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Government
of Canada

Gouvernement
du Canada

Canada

From: White, Kirsten M ENV:EX [<mailto:Kirsten.White@gov.bc.ca>]
Sent: February-14-19 11:05 AM
To: Taekema, Bernie John; McConnachie, Sarah
Cc: Doll, Andrea ENV:EX; Moores, Karen ENV:EX; Epps, Deb ENV:EX; Barlak, Rosie ENV:EX
Subject: RE: ENV-DFO discussion on fish pathogens

Hi Bernie and Sarah,

I'm following up to our Jan meeting and Andrea's email below. It looks like action items 1 through 3 have been addressed, although Bernie, you may have additional information coming from other DFO staff in regards to item 2—thank you for this.

I appreciate both of you are super busy, but please let me know when we might receive further information in regards to item 4. We are seeking a brief written summary of information in response to the questions outlined in the email below, as we will be putting our minds to the amendments for the larger (Tier 1) facilities very shortly. Any information that DFO can provide in regards to these questions, even if it is acknowledging where there are limitations or lack of information/evidence to inform certain conclusions would be very helpful.

Thanks very much in advance,

Kirsten

Kirsten White, B.Sc., P.Ag.
Authorizations Section Head
Authorizations - South
Ministry of Environment and Climate Change Strategy
phone: (250) 751-3193
email: Kirsten.White@gov.bc.ca
[Waste Discharge Authorizations Website](#)

24hr Spill/Environmental Emergency Reporting: 1-800-663-3456
24hr RAPP-line (Report All Poachers and Polluters): 1-877-952-7277

From: Taekema, Bernie John [<mailto:BernieJohn.Taekema@dfo-mpo.gc.ca>]
Sent: Thursday, January 31, 2019 1:48 PM
To: Doll, Andrea ENV:EX; McConnachie, Sarah
Cc: White, Kirsten M ENV:EX; Epps, Deb ENV:EX; Barlak, Rosie ENV:EX; Meier, Michelle ENV:EX; Moores, Karen ENV:EX; Downie, AJ ENV:EX; Graham, Tessa ENV:EX; 'Goluz, Marko (EC)'
Subject: RE: ENV-DFO discussion on fish pathogens

Hi Andrea,

I have spoken to DFO staff familiar with salmonid runs along the BC Coast with regard to your request for information related to the out-migration window for salmonid smolts. What I have heard that unless a stream or river has a counting fence associated with it specific data on a river system is not gathered. Having said that, in general the advice I received is that a majority of smolts along the BC coast migrate from their natal rivers to the north Pacific between February and the end of June. There are always exception, as for example the Skeena and Fraser systems will have some adult runs that migrate upriver in the late fall which will potentially correspond with a later smolt out-migration period. Another thing to consider is that smolts/juvenile salmon will hang around in the estuary for potentially several weeks or months.

DFO sea lice management licence conditions focus on the out-migration period of March-June as DFO data indicated that most of the smolt out-migration period will be captured within that time frame.

I have a couple of other DFO staff that I will get in touch with to see if they have additional information that may be helpful.

Bernie

From: Doll, Andrea ENV:EX [mailto:Andrea.Doll@gov.bc.ca]
Sent: January-30-19 5:13 PM
To: Taekema, Bernie John; McConnachie, Sarah
Cc: White, Kirsten M ENV:EX; Epps, Deb ENV:EX; Barlak, Rosie ENV:EX; Meier, Michelle ENV:EX; Moores, Karen ENV:EX; Downie, AJ ENV:EX; Graham, Tessa ENV:EX; 'Goluzza, Marko (EC)'
Subject: ENV-DFO discussion on fish pathogens

Hello Bernie and Sarah,

Thank you for attending a meeting with the Ministry of Environment (ENV) last Monday, January 28th. I promised to send out a summary of action items, including a request from ENV for a written summary of DFO's input on fish pathogens. Please see below and let me know your thoughts. Thanks so much.

Action items:

- ENV to forward email correspondence to DFO relating to collaboration between ENV and ECCC on fish processing facilities
- DFO to send ENV (Rosie) contact info for stock assessment information, ENV to follow up on the smolt migration season for rivers/estuaries with fish processing discharges
- DFO to provide an approximate timeframe in which ENV may receive the PRV risk assessment
- DFO to provide a written summary of items discussed at the Jan 28 meeting

With respect to the written summary, ENV would appreciate receiving something in writing from DFO on fish pathogens, as we do not have in house expertise in this field, and are therefore not well equipped to assess the potential for, and risk of, fish pathogens in fish processing discharges. We hope this task will not be onerous and would like to suggest that you could provide us with this information in bullet form, or whichever format is easiest for you. We are hoping you can provide us your understanding on any of all the following questions, which we discussed at our meeting:

- Based on existing evidence, what pathogens are causing disease outbreaks in wild fish in BC?
- Is it possible to determine an indicator fish pathogen with relevance to BC? (ie. one that could be used to assess the efficacy of effluent treatment)

- Are you aware of information about pathogen deactivation via disinfection, relevant to fish pathogens present in BC?
- Can you speak in general terms to the risk of fish pathogens causing disease in wild fish, as a result of discharges from fish processing plants?
- If you can, please differentiate risk of fish pathogens leading to disease, between:
 - wild and farmed salmon processors
 - salmonid and ground fish processors

We are hoping to receive this information from you in time to inform decision making on permits amendments we are planning for February. Please let us know if you'd be able to summarize this information for us by February 15th, or if you'd require more time. To reiterate, we are hoping that most of the information you'd provide would be a summary of what we've already discussed.

Thanks again for meeting with us and for considering our request.

Best regards,

Andrea Doll, MASc, PAg
 A/Section Head, Hazardous Waste and Forestry
 Authorizations – South
 Ministry of Environment and Climate Change Strategy
 2080 Labieux Rd Nanaimo BC V9T 6J9
 250 751-3195

- **Based on evidence, what pathogens are causing disease outbreaks in wild fish?**

We have very little information regarding this issue, especially in relation to wild Pacific salmonids. Reliable evidence cannot be provided. We do have some documentation on pathogens that are present in living salmon (see, for example, the following scientific paper:

<https://onlinelibrary.wiley.com/doi/pdf/10.1111/eva.12164>), but clinically diseased wild salmon are rarely recovered for various reasons (eg. predation).. Thus it is difficult to say which pathogens are most likely to cause disease outbreaks in wild salmon. Instead, we can discuss which pathogens *may* cause outbreaks, which are relevant to BC salmonids, and how they would behave in a processing plant:

- Bacterial Kidney Disease (BKD), caused by the agent *Renibacterium salmoninarum*
 - All Pacific salmonids are susceptible to this pathogen
 - May be a pathogen of concern for wastewater management, especially those that process wild Pacific salmonids (farmed Pacific and Atlantic salmon are screened and/or vaccinated for this pathogen)
- Furunculosis, caused by the bacteria *Aeromonas salmonicida*
 - Farmed Atlantic salmon and Pacific salmonids are susceptible, farmed fish are vaccinated, but sporadic outbreaks do occur following infection with atypical strains that are not covered by current vaccines
 - May be a pathogen of concern for wastewater management in facilities that process both Pacific and Atlantic salmon
- Sea lice infestation, caused by various species
 - These pests should be easily filtered out of wastewater due to relatively large particulate size; not a distinct concern unless the facility cannot filter out large particulates
 - SLICE resistant populations of lice are an emerging issue, and warrant special consideration. Processing plans and effluent treatment should ensure that resistant lice progeny are not disseminated
- *Loma salmonae*, microsporidian parasite
 - Outbreaks have been noted in wild Sockeye salmon in Alaska, but occurrence is rare
 - Only Pacific salmonids are susceptible (i.e., Atlantic salmon do not contract this disease or produce infective spores) so this pathogen would only be a concern to plants that process wild Pacific salmon
 - Spore phase is relatively environmentally resistant and may thus be a concern for facilities that process wild Pacific salmon
- Viral hemorrhagic septicemia virus (type IVa)
 - Usually carried by migrating herring, salmon are an aberrant host
 - Outbreaks are extremely rare on farms, but may be a concern where herring are processed

- Infectious haematopoietic necrosis virus (IHNV)
 - This virus is endemic in BC salmonids, and many Pacific salmonids are endemic carriers, especially Sockeye
 - This pathogen could be an important sentinel for plants that process Pacific salmonids
 - Outbreaks have been associated with processed rainbow trout from IHNV enzootic areas
 - All farmed Atlantic salmon are vaccinated for this pathogen and thus should not be a relevant source of viral particles
 - Farms in BC adhere to a Viral Disease Management Plan which dictates culling of infected farms and no discharge of materials into the marine environment
- Salmonid rickettsial septicaemia (SRS) caused by the bacteria *Piscirickettsia salmonis*
 - Both farmed Atlantic and Pacific salmonids are susceptible to SRS. Outbreaks are sporadic, but may be increasing with increasing ocean water temperatures. When outbreaks occur they are treated with antibiotics, but could be a pathogen to monitor in wastewater systems.
- **Is it possible to determine an indicator fish pathogen with relevance to BC? I.e., one that could be used to assess the efficacy of effluent treatment**

I will use the above discussion for context for this question:

- Plants that process wild Pacific salmon that may release pathogens of concern:
 - For these facilities it may be prudent to use environmentally-resistant pathogens, such as the microsporidian parasite, *L. salmonae* as an indicator. This pathogen produced an easily traceable spore. Disinfection methods can test for the presence of in-tact spores (in-tact spores can be easily identified using phase-contrast microscopy).
 - Most Pacific salmonids will have low levels of infection with this pathogen (i.e., fish are infected but do not have relevant clinical disease)
 - Atlantic salmon cannot be infected with this pathogen and do not produce viable spores, and is thus not relevant to plants that process Atlantic salmon.
 - IHN may be the most relevant pathogen of concern for Pacific salmon
 - Farmed salmon are currently vaccinated for this pathogen
 - There is existing literature stating disinfection requirements to eliminate this pathogen (See discussion in Skall and Olesen, 2011, referenced below).
- Plants that process Atlantic salmon:

- Since Atlantic salmon are vaccinated for most pathogens of concern for Pacific salmonids, or they are resistant to other relevant pathogens, it is more difficult to choose an indicator pathogen.
 - Recent debate and discussion about Piscine orthoreovirus (PRV) have not yet determinately determined the risk to either Pacific or Atlantic salmon, but it may be useful as an indicator pathogen for the following reasons:
 - It is ubiquitous in the environment, and can be found in both Pacific and Atlantic salmon
 - The viral structure has similarities to Infectious Pancreatic Necrosis virus (not found in the North Pacific), which is used as an indicator virus for salmon processing plants throughout jurisdictions in the Atlantic ocean
 - Disinfection methods for IPN are well-characterized (can be found easily in a literature search; see review of disinfection techniques by Munro and Midtyng, 2011)
 - Both are viruses with double-stranded RNA and no envelope
 - The lack of viral envelope makes the viruses more stable in the environment, and thus more difficult to disinfect/deactivate
 - A significant challenge to using PRV is that determination of live, infectious PRV is only possibly via bioassay (eg. confirmed infection of live fish). This virus is currently unable to be grown on cell culture.
 - **SEE the following reviews:**
 - Siah A, Powell, J, Farrell A. 2018. Piscine orthoreovirus (PRV) in processing plant wastewater: A review of risk factors for wild Pacific salmon. BC CAHS and University of BC.
 - Skall HF, Olesen NJ. 2011. Treatment of wastewater from fish slaughterhouses: Evaluation and recommendations for hyginisation methods. National Veterinary Institute, Technical University of Denmark.
 - Provides a good overview of current legislation in other jurisdictions and a summary of most effective wastewater treatments for pathogen neutralization.
- **Are you aware of information about pathogen deactivation via disinfection, relevant to fish pathogens present in BC?**

See the provided references above, and additional reviews for the various pathogens listed above - easily found during a targeted literature search.

- **Can you speak in general terms to the risk of fish pathogens causing disease in wild fish, as a result of discharges from fish processing plants?**

Most available research is based on risk to other farmed fish. In the Atlantic Ocean for example, “processing plant distance” from other farms has been indicated as a risk factor for subsequent farm outbreaks in viral diseases such as IPN and ISA (See Murray et al., 2004; Murray and Peeler 2005; Ibieta et al., 2011; Munro et al., 2003 as some examples). This factor is important enough to warrant management where effluent is treated to the standard in which these pathogens are deactivated. Neither of these viruses is present in BC, and it does not appear there is a specific pathogen that would represent an equivalent risk currently in BC other than IHNV which is currently using an effective vaccine (but could pose a risk in facilities processing wild Pacific salmon – the natural carriers for IHNV). In the context of BC, it is wise to use a proactive approach. Utilizing an indicator pathogen regardless of its proven risk to wild salmon, will ensure that if a pathogen does become a concern, proper wastewater management is already in place.

- **If you can, please differentiate risk of fish pathogens leading to disease, between:**
 - **Wild and farmed salmon processors**
 - Most pathogens relevant to wild Pacific salmon are either: not present in Atlantic salmon (e.g., *L. salmonae*), or Atlantic salmon are vaccinated for those pathogens and thus would not act as a point source in a processing plant. It would be wise to implement controls to ensure particulate matter is removed (e.g., to ensure sea lice are retained and destroyed), and that wastewater treatment is robust enough to deactivate most pathogens (e.g., spores, bacteria, environmentally-resistant viruses) to ensure that if aberrant infections do occur in Atlantic salmon, effluent is not a risk factor for further transmission. Processing wild Pacific salmon may be a larger concern in smaller facilities, as these fish are not vaccinated for pathogens of concern and are more likely to carry multiple pathogens that could theoretically act as a source of infection for wild fishes.
 - **Salmonid and ground fish processors**
 - The specific pathogen profiles of Pacific groundfish have not been investigated, so a statement about the risk cannot be made.

Maley, Shelley

From: McCorquodale, Brenda
Sent: February-25-19 1:01 PM
To: Waddington, Zac; Jepps, Shelley; Paylor, Adrienne; Chamberlain, Jon; McConnachie, Sarah
Subject: RE: Ecologically based areas for Area Based Management

Hi guys – can you call me into the meeting please?
Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des peches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

-----Original Appointment-----

From: Waddington, Zac
Sent: Thursday, February 21, 2019 4:50 PM
To: Waddington, Zac; Jepps, Shelley; McCorquodale, Brenda; Paylor, Adrienne; Chamberlain, Jon; McConnachie, Sarah
Subject: Ecologically based areas for Area Based Management
When: Monday, February 25, 2019 1:00 PM-2:00 PM (UTC-08:00) Pacific Time (US & Canada).
Where: DFO CONF Courtenay-103-2435 Mansfield Drive-1-Courteney CONF MPO

I would like to set up a meeting at the proposed time to discuss the approach we could take, and the science support needed, to determine ecologically based areas that will exist within the broader Area Based Management initiative.

<< File: Cantrell, et al., 2018. Farm Connectivity with particle tracking.pdf >>
Hopefully we can discuss more next week,

Zac

s.21(1)(a)
s.21(1)(b)

Maley, Shelley

From: Manchester, Howie
Sent: February-26-19 7:26 PM
To: Waddington, Zac
Subject: Ross pass and north site sampling

Okay, we will work on getting the SL numbers for the sites that are over, I believe Bare Bluff, Bedwell and Plover. I will see if we can get the information on what is their mitigation plan for each site.

On another note we have collected gill (second and third gill arch) samples from 20 fish at Ross Pass into individual Whirl-paks,; [REDACTED] I also collected from 5 of these fish into individual whirl-paks head and trunk kidney as well as spleen in case we wanted to run some tissue cultures on these as well. [REDACTED] also the time of year is right and there were many herring and pilchard in the pens, only thing though is that samples from this site [REDACTED]

Records at Millar indicated that there was a Chrysochomilina bloom around mid January, this plankton has been thought to cause gill damage which does not translate to mortalities about a month later. Millar mortalities look the same as Ross Pass.

Were you thinking of getting these samples to Kyle Garver? I can get Angela to drop these off to his lab on Friday if that's what you have planned, let me know.

Thanks

Howie

-----Original Message-----

From: Waddington, Zac
Sent: February-26-19 12:37 PM
To: Manchester, Howie
Subject: RE: Live

No worries if it can't work. Getting the latest sea lice counts would be most important. And any mitigation/harvest plans for the sites that are over.

Zac

-----Original Message-----

From: Manchester, Howie
Sent: February-26-19 12:27 PM
To: Waddington, Zac
Subject: Re: Live

s.20(1)(b)

s.21(1)(b)

Okay, will do, not sure if we can sample Bare Bluff sin E they are into full harvest.

Howie

Sent from my BlackBerry 10 smartphone on the Bell network.

Original Message

From: Waddington, Zac

Sent: Tuesday, February 26, 2019 09:18

To: Manchester, Howie; Barry, Melanie

Subject: FW: Live

See Ben's response below. So don't worry about collecting any lice. But it would be excellent if you guys could get the latest counts from Bare, Bawden and Plover while you are out there. Not that you have to audit them, but if you can see the latest counts in their database that would be excellent.

Zac

-----Original Message-----

From: Ben Koop [<mailto:bkoop@uvic.ca>]

Sent: February-26-19 8:54 AM

To: Waddington, Zac

Subject: Re: Live

Zac- Unfortunately I am scaling back out sea lice work due to lack of funds. At this point most of the value of collections may come from lice that have been phenotypes directly by bioassays so that each individual can be tested

All the Best

b

Ben F Koop PhD FRSC

Professor & Canada Research Chair

Biology/Centre for Biomedical Research

University of Victoria

On 2/25/19, 12:05 PM, "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca> wrote:

>Hello again,

>

>We are doing another sea lice audit out in Clayoquot at a farm with a

>history of SLICE resistance, and I believe a bioassay which confirmed

>ongoing resistance in the past month or so. We do not have the budget

>or capacity to live sample in order to perform another bioassay (which

>would be redundant regardless), but I was curious if there was any

>value in us sampling lice into ethanol for you? Or do you need to know

>who are the "survivors" of the bioassay for your genetic analysis to have any value?

>

>Zac

>

>-----Original Message-----

>From: Ben Koop [<mailto:bkoop@uvic.ca>]

>Sent: May-30-18 2:59 PM

>To: Waddington, Zac

>Subject: Live

>

>Zac

>

>Yes, if we can set this up correctly, proper biosassays with positive +

>negatives/deads _ alive, this is worth pursuing. If notes then these

>are the sample Mark Fast should be using

>

>Sorry if this is late

>

>The key is to get both morphs from the same population

>

>All the best

>

>Ben

>Sent from my iPhone

Claquot Cermaq Sites sea lice status (April – present)

Bare Bluff

- Site reached over threshold in late May 2018
- Peroxide done June 7 – 10
- Slice started – August 16 – reason indicated (pers. Comm. from Cermaq vet) is welfare issues due to a Caligus infestation, a FHE was submitted for this treatment.
July 2018 industry sea lice report indicated no Caligus or chalimus issues.
- Latest Bioassays result–

Bawden

- Slice done February 2018
- Peroxide done June 11 – 14, 2018
- Harvested to be completed August 28, 2018

Bedwell

- Peroxide done July 7 – 10, 2018
- Slice started – August 18, 2018 - reason indicated (pers. Comm. from Cermaq vet) is welfare issues due to Caligus infestation, a FHE was submitted for this treatment.
- July 2018 industry sea lice report indicated no Caligus issues but high chalimus counts.
- Latest Bioassay result–

Dixon

- 2018 generation harvested out May 2018
- New fish (2019 generation) scheduled to enter from Boot Lagoon and Oceans hatchery starting August 29, 2018
- Company has provided a SL management plan for the new entries including treating fish with a drug in freshwater that will prevent sea lice infection for up to 9 months in sea water.

Fortune

- Peroxide done July 8 – 11, 2018
- Slice started – August 15, 2018 - reason indicated (pers. Comm. from Cermaq vet) is welfare issues due to a Caligus infestation, a FHE was submitted for this treatment.
- July 2018 industry sea lice report indicated low level Caligus but high chalimus counts.
- Latest Bioassay result–

Millar

- 2018 generation harvested out March 2018

- New fish (2019 generation) predicted to enter from Boot Lagoon and Oceans hatchery in October 2018.
- Company has provided a SL management plan for the new entries including treating fish with a drug in freshwater that will prevent sea lice infection for up to 9 months in sea water.

Mussel Rock

- 2018 generation harvested out June 2018
- No plans submitted to re stock in 2018

Plover

- Peroxide done June 7 – 10, 2018
- Slice started – August 18, 2018 - reason indicated (pers. Comm. from Cermaq vet) is welfare issues due to a Caligus infestation, a FHE was submitted for this treatment.
- July industry sea lice report indicated low level Caligus and chalimus counts.
- Bioassay – Latest bioassay result -

Rant Point

- Some harvesting in July and August 2018
- Peroxide was scheduled for May 2018, no indication that this was completed. We will check while on site next week (August 28th)

Ross Pass

- 2018 generation harvested out April 2018
- 2019 generation predicted to be stocked from Boot Lagoon and Oceans October 2018
- Company has provided a SL management plan for the new entries including treating fish with a drug in freshwater that will prevent sea lice infection for up to 9 months in sea water.

Saranac

- 2018 generation harvested out June 2018
- 2019 generation predicted to be stocked November 2018, no indication of source hatchery.

Esperanza & Nootka Sites Sea lice status (April – present)

Atrevida

- Harvested out in April 2018
- No forecast to re-stock in 2018

Concepcion

- Harvested out in June 2018
- Forecast to re-stock in October 2018

Esperanza

- Fish in from Hecate and Steamer in May 2018
- SLICE treatment pending for July and August, not able to feed out due to plankton.
- Bioassay results –

Gore

- Some peroxide treatments in March and May
- Harvested out in June.
- Forecast to re-stock in December 2018

Hecate

- SLICE treatment pending for July and August, not able to feed out due to plankton.
- Bioassay results –

Muchalat North

- Harvested out in April 2018
- Forecast to re-stock in September 2018

Muchalat South

- Harvested out in June 2018
- No plans to re-stock in 2018

Steamer Point

- SLICE treatment pending for July and August, not able to feed out due to plankton.
- Bioassay results –

Quatsino Sites Sea lice status (April – present)

- No sea lice issues noted on any of the Quatsino sites since April 2018.
- No treatments notes since then, this area has been fallow since June 2018.
- Re stocking to begin in October 2018

[illegible]

Best available copy

28-May-18	12.4
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05/04/2018	107	13.8
14/04/2018	101	13.5
18/04/2018	104	18.1
18/04/2018	106	19.7
28/04/2018	101	24.8

Fortune		April	May	June	July	August
04/04/2018	106	0.6	3.8	no June counts due to mouth rot treatments	08/07/2018 101	8.7
16/04/2018	106	0.3	3.3		08/07/2018 103	5.8
16/04/2018	105	0.5	4.4		21/07/2018 102	3.2
18/04/2018	102	0.6			08/07/2018 105	10.6
26/04/2018	106	1.2			20/07/2018 105	0.9
27/04/2018	104	1.5			08/07/2018 106	6.2
29/04/2018	101	2.1			20/07/2018 109	7.1

Millar		April	Harvested Out
02/04/2018	104	29.1	

Mussel Rock		April	May	June	Harvested Out
02/04/2018	103	2.2	6.5	23.1	
03/04/2018	105	1.8	10.7	7.8	
14/04/2018	101	6.9	9.4	11.8	
16/04/2018	104	2.5	9.6	35.8	
16/04/2018	106	2.1	17.1		
28/04/2018	101	8.7	8.4		
30/04/2018	107	3.7	7.0		

Plover		April	May	June	July	August
03/04/2018	104	0.8	1.7	2.9	05/07/2018 104	4.2
01/04/2018	108	1.0	3.7	3.6	17/07/2018 101	7.4
13/04/2018	101	0.6	3.5	3.3	05/07/2018 101	4.8
14/04/2018	104	1.6	9.1	4.3	05/07/2018 102	2.4
15/04/2018	105	0.9	4.7	4.8	20/07/2018 105	6.9
27/04/2018	108	3.0		2.6	18/07/2018 103	6.6
27/04/2018	109	1.7		0.4		
29/04/2018	101	1.5		2.7		
				2.3		

Rant		April	May	June	July	August
02/04/2018	101	4.1	5.4	11.5	17/07/2018 102	20.5
12/04/2018	110	4.8	5.0	11.0	05/07/2018 104	16.2
12/04/2018	109	3.5	9.1	7.2	16/07/2018 101	10.6
16/04/2018	101	5.9	6.6	14.2	05/07/2018 101	16.6
26/04/2018	102	7.5	9.3	7.1	17/07/2018 103	17.3
27/04/2018	104	6.3	15.1	16.8	05/07/2018 103	14.9
30/04/2018	101	8.1	9.4			
			13.9			
			6.1			

Peroxide was proposed for treatment in May, we have no indication that this took place, we can check on site during audits next week.

Ross Pass		April	May	Harvested Out
03/04/2018	105	16.8	31.1	
02/04/2018	104	20.2	32.7	
14/04/2018	101	34.4	34.7	

Best available copy

15/04/2018	108	25.6
16/04/2018	108	23.7
17/04/2018	104	29.9
Saranac		
13/04/2018	102	6.8
14/04/2018	108	11.0
15/04/2018	111	8.1
16/04/2018	102	13.3
28/04/2018	110	17.2
28/04/2018	101	9.2
29/04/2018	102	18.5
May		
13-May-18	105	11.6
13-May-18	103	9.1
14-May-18	102	21.3
26-May-18	110	19.2
26-May-18	111	11.1
30-May-18	102	26.6
30-May-18	103	14.4
30-May-18	109	9.5
June		
08/06/2018	107	13.4
10/06/2018	101	8.6
11/06/2018	102	28.6
23/06/2018	111	18.8
24/06/2018	109	21.2
25/06/2018	102	25.3
July		
03/07/2018	103	21.4
02/07/2018	101	10.3
01/07/2018	102	10.0
August		
Harvested Out		

Maley, Shelley

From: Manchester, Howie
Sent: February-26-19 7:27 PM
To: McConnachie, Sarah
Subject: FW: Ross pass and north site sampling

Sorry should have cc'd you on the message below.

Howie

-----Original Message-----

From: Manchester, Howie
Sent: February-26-19 7:26 PM
To: Waddington, Zac
Subject: Ross pass and north site sampling

Okay, we will work on getting the SL numbers for the sites that are over, I believe Bare Bluff, Bedwell and Plover. I will see if we can get the information on what is their mitigation plan for each site.

On another note we have collected gill (second and third gill arch) samples from 20 fish at Ross Pass into individual Whirl-paks;; [REDACTED] I also collected from 5 of these fish into individual whirl-paks head and trunk kidney as well as spleen in case we wanted to run some tissue cultures on these as well. [REDACTED] also the time of year is right and there were many herring and pilchard in the pens, only thing though is that samples from this site [REDACTED]

Records at Millar indicated that there was a *Chrysochomilina* bloom around mid January, this plankton has been thought to cause gill damage which does not translate to mortalities about a month later. Millar mortalities look the same as Ross Pass.

Were you thinking of getting these samples to Kyle Garver? I can get Angela to drop these off to his lab on Friday if that's what you have planned, let me know.

Thanks

Howie

-----Original Message-----

From: Waddington, Zac
Sent: February-26-19 12:37 PM
To: Manchester, Howie
Subject: RE: Live

s.20(1)(b)
s.21(1)(b)

No worries if it can't work. Getting the latest sea lice counts would be most important. And any mitigation/harvest plans for the sites that are over.

Zac

-----Original Message-----

From: Manchester, Howie
Sent: February-26-19 12:27 PM
To: Waddington, Zac
Subject: Re: Live

Okay, will do, not sure if we can sample Bare Bluff sin E they are into full harvest.

Howie

Sent from my BlackBerry 10 smartphone on the Bell network.

Original Message

From: Waddington, Zac
Sent: Tuesday, February 26, 2019 09:18
To: Manchester, Howie; Barry, Melanie
Subject: FW: Live

See Ben's response below. So don't worry about collecting any lice. But it would be excellent if you guys could get the latest counts from Bare, Bawden and Plover while you are out there. Not that you have to audit them, but if you can see the latest counts in their database that would be excellent.

Zac

-----Original Message-----

From: Ben Koop [<mailto:bkoop@uvic.ca>]
Sent: February-26-19 8:54 AM
To: Waddington, Zac
Subject: Re: Live

Zac- Unfortunately I am scaling back out sea lice work due to lack of funds. At this point most of the value of collections may come from lice that have been phenotypes directly by bioassays so that each individual can be tested

All the Best

b

Ben F Koop PhD FRSC
Professor & Canada Research Chair
Biology/Centre for Biomedical Research
University of Victoria

On 2/25/19, 12:05 PM, "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca> wrote:

>Hello again,

>

>We are doing another sea lice audit out in Clayoquot at a farm with a
>history of SLICE resistance, and I believe a bioassay which confirmed
>ongoing resistance in the past month or so. We do not have the budget
>or capacity to live sample in order to perform another bioassay (which
>would be redundant regardless), but I was curious if there was any
>value in us sampling lice into ethanol for you? Or do you need to know
>who are the "survivors" of the bioassay for your genetic analysis to have any value?

>

>Zac

>

>-----Original Message-----

>From: Ben Koop [<mailto:bkoop@uvic.ca>]

>Sent: May-30-18 2:59 PM

>To: Waddington, Zac

>Subject: Live

>

>Zac

>

>Yes, if we can set this up correctly, proper biosassays with positive +

>negatives/deads _ alive, this is worth pursuing. If notes then these

>are the sample Mark Fast should be using

>

>Sorry if this is late

>

>The key is to get both morphs from the same population

>

>All the best

>

>Ben

>Sent from my iPhone

Maley, Shelley

From: Waddington, Zac
Sent: March-01-19 12:03 PM
To: Fenton, AJ
Subject: Powerpoints.
Attachments: FHAIP summary.ppt; Sea Lice Management Challenges.pptx

See the attached powerpoints which should have some text, pictures and graphics that may be of use to you. Let me know if you need any clarification.

Dr. Zac Waddington DVM, B.Env.Sc.(Hons)
Lead Veterinarian - Pacific Region
Fisheries and Oceans Canada | Pêches et Océans Canada
Aquaculture Environmental Operations - Fish Health
Courtenay, British Columbia
Telephone | Téléphone: 250-703-0902
Fax | Télécopieur: 250-703-0921
Zac.Waddington@dfo-mpo.gc.ca



DFO in the Field: Fish Health Audit and Surveillance Intelligence Program (FHAIP)



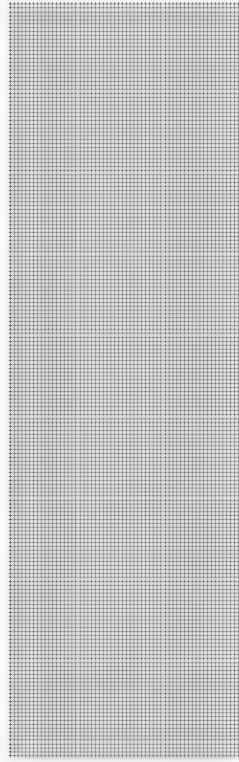
Canada



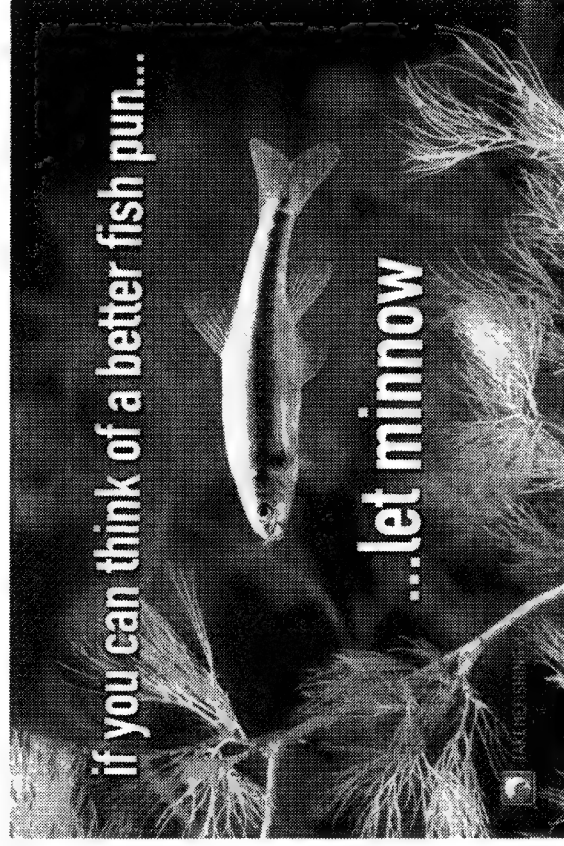
Industry Submitted Fish Health Reports

Industry reporting required by COL include:

- Quarterly mortality by cause including any treatment applications
- Fish health event notifications
- Mortality event notifications
- Monthly sea lice abundance reports
- Sea lice over threshold notifications



s.21(1)(a)
s.21(1)(b)

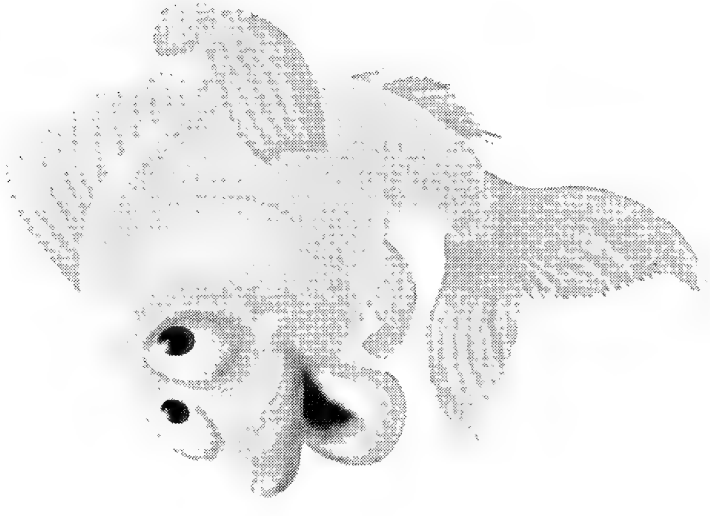


Canada



Fish Health Audit and Surveillance Program

- World's most exhaustive routine auditing and sampling program of aquaculture (that I am aware of)
- More than 15 years of independent fish health and sea lice data
- More regulatory oversight than any other food production industry in Canada
- Highly trained biologists and veterinary staff
- ~\$600,000 in program expenses annually





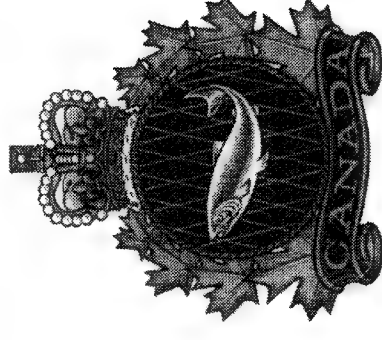
FHASP Origins

- Began 2001 by BC Ministry of Agriculture and Lands (BCMAL)
 - in response to 1997 Environmental Assessment Review of Aquaculture
- DFO adopted program in 2010 when oversight of aquaculture transferred to federal authority
- Sampling design has remained consistent; specific testing has evolved



BRITISH
COLUMBIA

Ministry of
Agriculture



Fisheries and Oceans
Canada

Canada



FHASP Goals

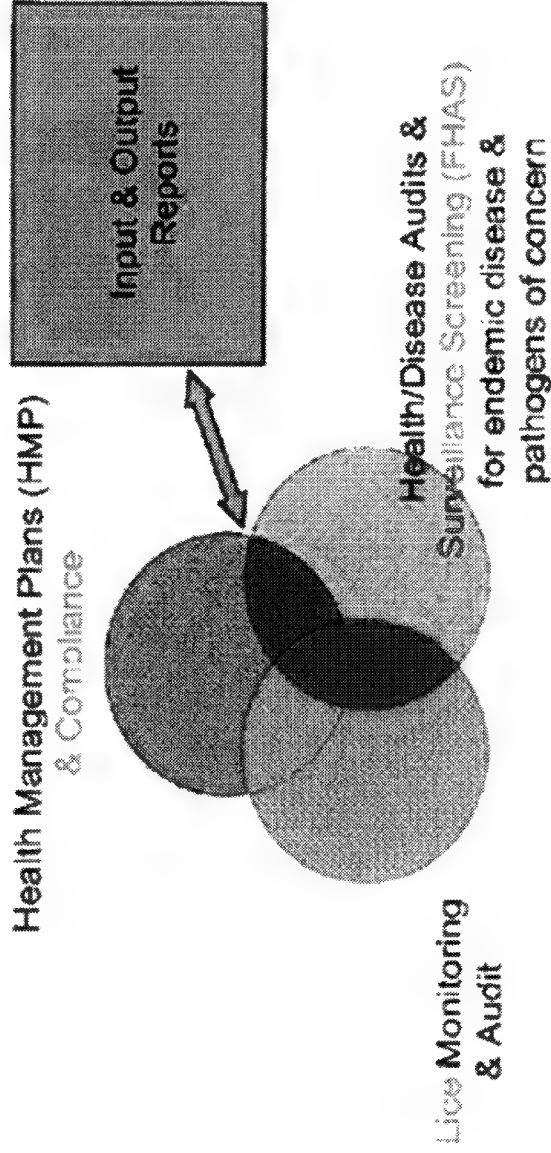


Yet to be formally defined.....

- Minimize harm resulting from disease and parasite transmission between farmed and wild fish
- Maximize use of audit data to inform decision-making and improve understanding of on-farm health and disease
- Verify industry reported data and compliance with regulations
- Build public confidence in the government's regulation and oversight of the aquaculture industry
- Increased involvement of First Nations in the audit program



Components of AMD Fish Health Ops



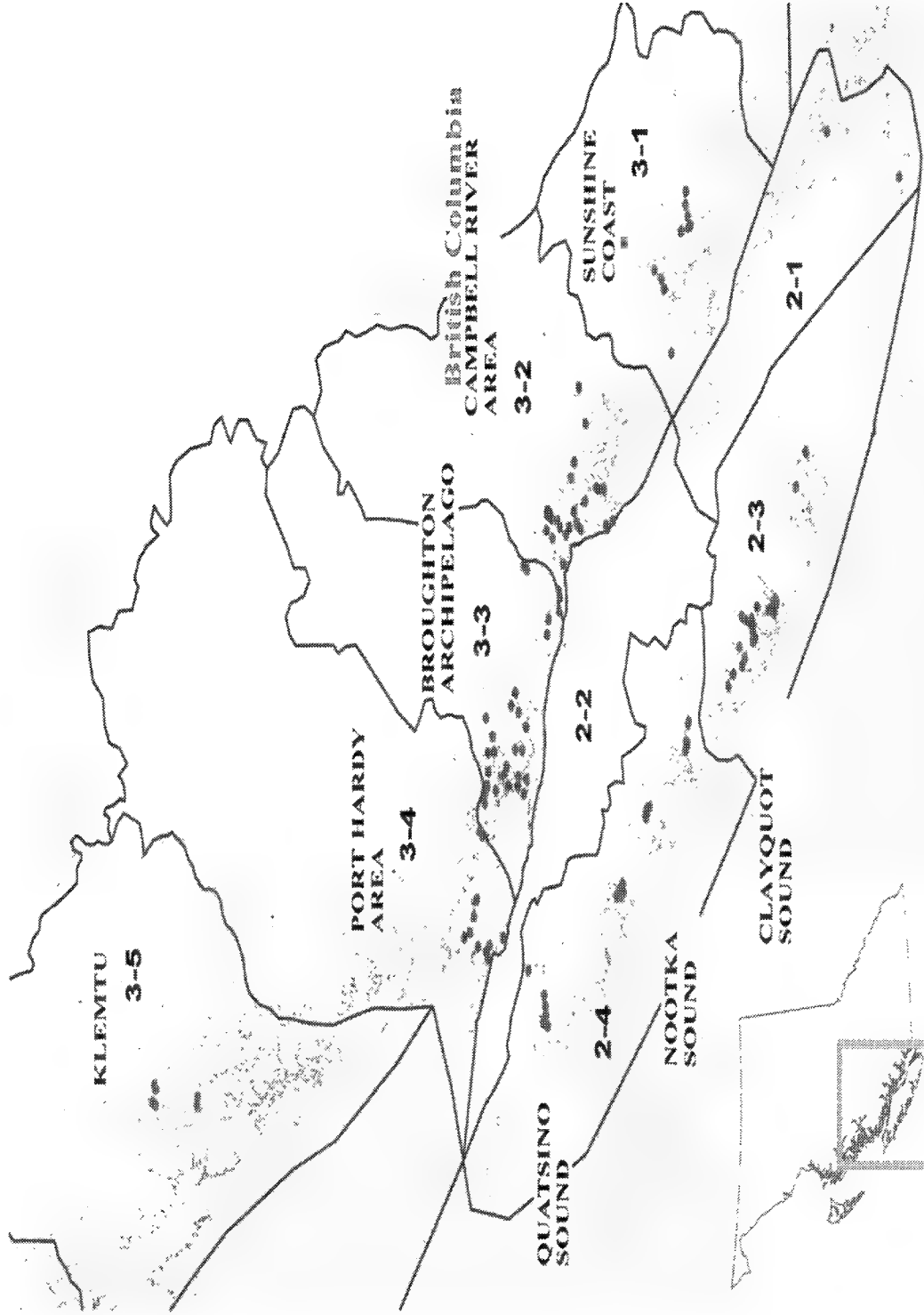


Fish Health Audit and Surveillance Program

- Audit of compliance with Health Management Plan and Conditions of Licence
- Audit and inspect on-site husbandry, biosecurity, staff training, data collection/categorization, records, fish welfare, knowledge of reporting obligations
- Collection of independent samples for analysis
 - Surveillance screening for reportable diseases (e.g. ISA, SAV, IPN and IHNV, VHSV).....CFIA involvement
 - Diagnosis of endemic disease
 - Surveillance for emerging disease
- Reporting findings of audits (sea lice audits, Report E, compliance)



Fish Health Zones





Sampling Design and Rationale

30 facilities are audited per quarter:

- Each fish health zone has at least one farm audited per quarter and the audit effort is proportional to the number of farms in the zone.
- The 30 farms are randomly selected from all active Atlantic and Pacific salmon sites within a quarter (approximately 50 active farms per quarter)

Rationale for 30 facilities for auditing per quarter:

- 30 is the minimum number of farms for robust statistical analysis.
- Allows comparison with industry health reports and early detection of changes in health status
- Detection of emerging disease
- Active surveillance to support the NAAHP led by CFIA



Health Management Plan

An addendum to the Conditions of Licence addressing four main areas:

1. Characterizing health of fish
2. Identifying and managing risks
3. Reducing exposure to disease-causing agents
4. Judicious application of drugs and chemicals



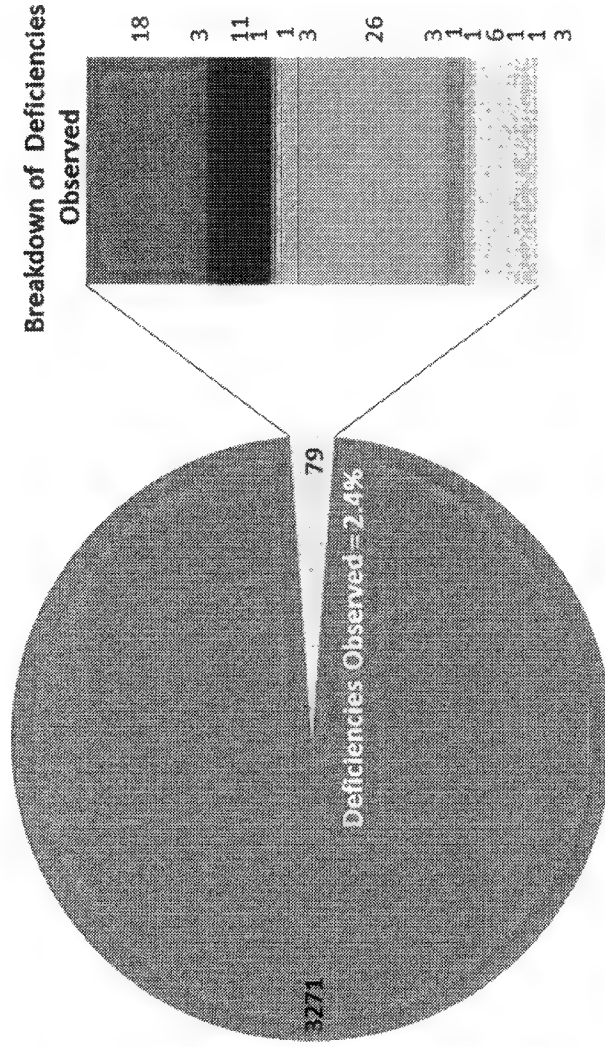


Monitoring for Compliance to Health Management Plans

- The Health Management Plan (HMP) is written at the company level and the practices are applied at the site or fish level (SOPs)
- DFO monitors compliance to the HMP at each marine grow-out facility at least once per production cycle (often ends up being 2-3 times per production cycle). A standardized checklist is used to track compliance.
- Letters are sent to the companies indicating any deficiencies identified in implementing their HMP
- An annual public report indicating the results of the HMP monitoring is created.

2017 DFO Fish Health Management Plan Inspections at Salmon Aquaculture Sites in B.C.

A total of 124 HMP site inspections were completed in 2017. All facilities are in compliance with the licence in that they have implemented an HMP; however, there may be need for improvement. The FH team performs audits on site to assess adherence to the HMP and DFO communicates any need for improvement (deficiencies) to the facility. A total number of 3271 HMP elements were scored in 2017, of these 79 deficiencies were noted. During 70 of those facility visits, no deficiencies were observed.



Category of Deficiency

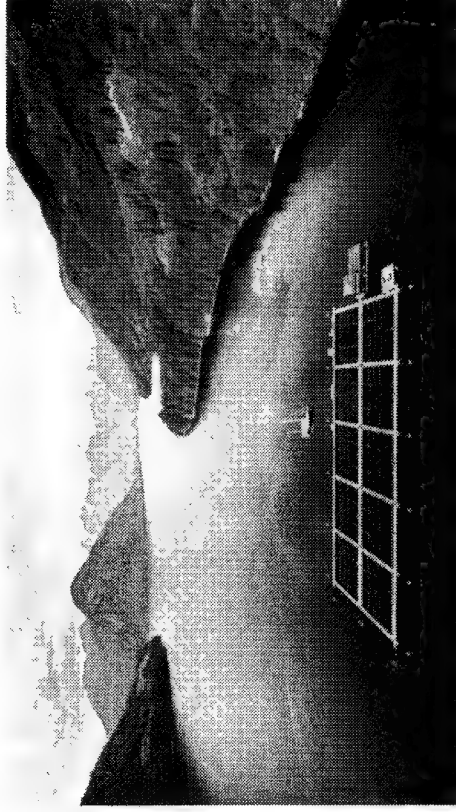
- Carcass retrieval protocol or record keeping needs improvement
- Current licence was not posted at facility
- Disease contingency or Mass mortality information or records needs improvement
- Fish handling, euthanasia protocol or records
- Footbaths or sanitizers needs improvement
- Husbandry or record keeping as per COL Appendix VIII-A or VIII-B needs improvement
- Lice protocol or lice records as per COL Appendix VII or VII-A needs improvement
- Mooring signage needs improvement
- Mortality assessment or classification needs improvement
- Nutritional or medicated feed protocol concerns
- Training documentation is not up-to-date
- Transfer records are not complete or up-to-date
- Visitor protocol communication needs improvement
- Water quality monitoring, equipment or record keeping needs improvement
- Wild fish mortality records need clarification



On-site Fish Health Audit Procedures (Marine)

DFO fish health professionals:

1. Monitor activities and review health-related records & site implementation of elements of the HMP
2. Compare farm records with reports submitted directly to DFO each month or calendar quarter
3. Observe fish behavior and husbandry on site
4. Collect samples from recently dead “silver” carcasses and submit for diagnostic testing.



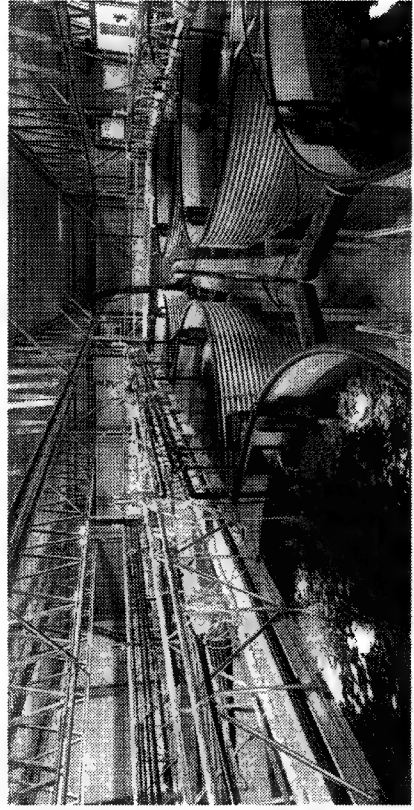


On-site Fish Health Audit Procedures (Hatcheries)

Formal freshwater auditing program pending.....

Currently DFO fish health professionals:

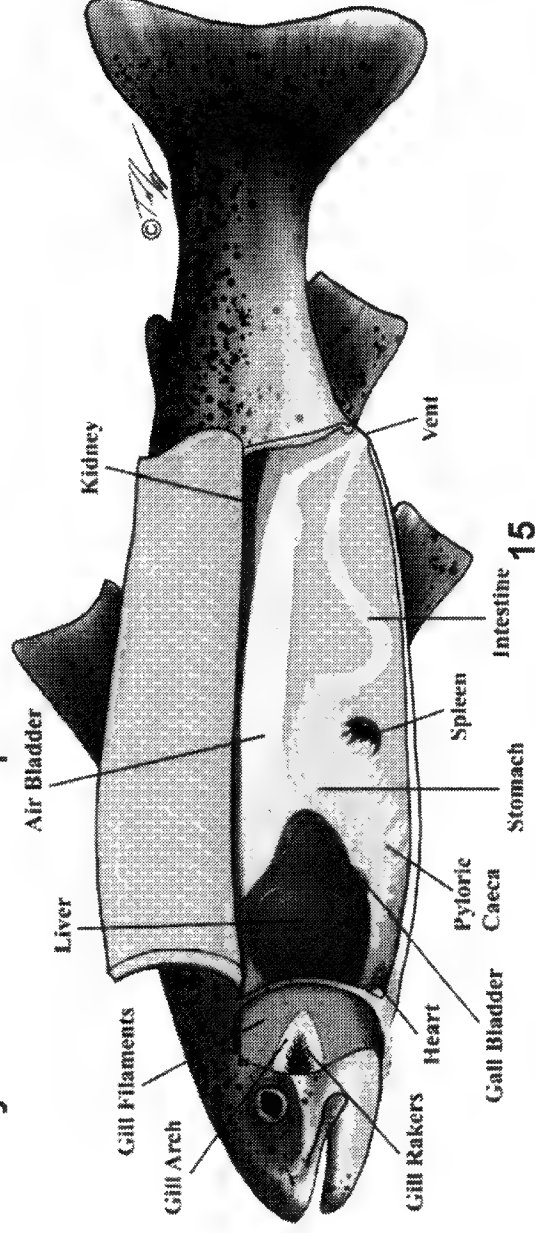
1. Monitor activities and review health-related records & site implementation of elements of the HMP
2. Compare farm records with reports submitted directly to DFO
3. Observe fish behavior and husbandry on site





Standardized Sampling of Carcasses and Tissues for Laboratory Testing:

- Five to 10 “silvers” per farm are collected. 600 to 900 fresh carcasses are assessed annually.
- Multiple tissues are sampled for histopathology from each silver.
- Molecular testing is conducted for ISA_v, IHNV, IPNV, SAV, VHSV and Psal
- Kidney tissue is sampled for bacterial isolation.





Selecting “Silvers” for Sampling



s.19(1)



Conducting Necropsy



Canada



Field Observations

Necropsy score MBD	Necropsy score AHS	Necropsy score VPT	Necropsy score GIF	Necropsy score VWF	Necropsy score BHM	Necropsy score MRT	Gross necropsy lesions / comments (see Key tab)
0	0	0	0	0	0	0	fluid (clear) in the abdominal cavity
0	0	0	0	0	0	0	yellow tinged clear fluid in cavity; pale heart & liver & kidney; large clot behind liver
0	0	0	0	0	1	0	dark spleen; BHM-pink brain, congested PC & GI
1	0	0	1	0	1	0	Euthanized by c.d.; BHM=dilated by
0	0	0	0	0	1	0	BHM=dilated by; coagulated clot in heart
0	0	0	1	0	1	0	BHM=dilated by; Pale gills; clear fluid around heart
0	0	1	0	0	0	0	yellow clear liquid in AB CAV; Pale organs. VPT-L & PC yellow
0	0	1	0	0	0	0	coloured muscle, swollen vent
0	0	0	0	0	1	0	BHM=dilated by; Red gut, dilated by in PC
0	0	0	1	0	0	0	no comment
0	0	1	0	0	1	0	yellow belly; VPT in PC & liver; yellow tinged clear fluid in cavity (as #2)
1	0	1	0	0	1	0	Euthanized by c.d.; yellow exterior; yellow tinged clear fluid in cavity & pale organs (heart, liver, kidney) (as #2); VPT in muscle & PC
0	0	1	0	0	0	0	Dilated by in PC; Pale liver & clear yellow fluid. VPT in pale liver; red gut

During necropsy, tissues and organs are described using a standardized scoring method.

- Normal vs. abnormal
- Scoring of abnormal (e.g. 0-5 for gills)

Gill scores for on site examination



Infection level	Gill score	Gross description
Clear	0	No sign of infection and healthy red colour
Very light	1	1 white spot, light scarring or undefined necrotic patching
Light	2	2-3 small spots / small mucous patch
Moderate	3	Attached thickened mucous patch or spot groupings up to 20% of gill area
Advanced	4	Lesions covering up to 50% of gill area
Heavy	5	Extensive lesions covering most of the gill surface

Rudi Teyssier, B.S., Muller, W.J., Cook, M.T., Kuba, P.D., Elliott, N.G., 2009. Aquaculture 290, 1-8.



Diagnostic Results

- All diagnostic laboratory testing is done at the Provincial Animal Health Center (AHC)
- Surveillance screening tests for the presence of reportable pathogens under the regulatory authority of CFIA:

- Infectious Salmon Anaemia Virus (ISAV)
 - Infectious Pancreatic Necrosis Virus (IPNV)
 - Salmon Alphavirus (SAV)
 - Infectious Hematopoietic Necrosis Virus (IHNV)
 - Viral Hemorrhagic Septicemia (VHSV)
- Not found in Pacific watershed
- Endemic diseases

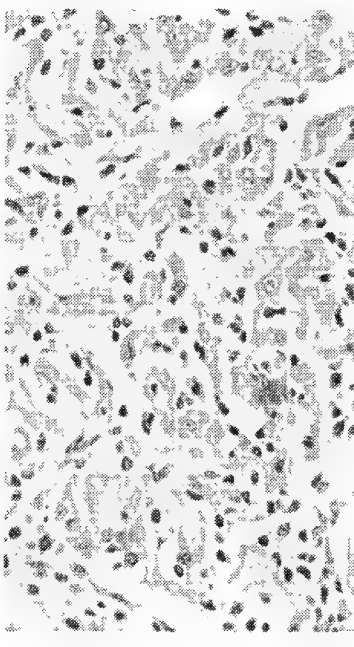


Diagnostic Results



Veterinary histopathologist's cause of death diagnosis:

- The veterinary histopathologist examines tissues from the carcasses at the microscopic level (histology).
- From the type and severity of damage to tissues, they assign cause- of-death diagnosis for each carcass.
- The histopathology approach is key for the detection of emerging disease and is the medical approach to determine cause of death.





Diagnostic Results

- DFO veterinarian make farm-level diagnoses based on:
 - field observations
 - necropsy findings
 - histopathology reports
 - on-farm health and environmental records
 - virology, bacteriology, and molecular diagnostics
 - historical context (e.g. treatments, season, past site performance)
- Findings from audit data are also used for early detection of changes in frequency of endemic diseases that may warrant the attention of DFO Science for research.
- In addition, monitoring for emerging disease is conducted through careful assessment of the data collected.



Sea Lice Monitoring

- Aquaculture facilities growing Atlantic salmon must reports monthly sea lice abundance for 20 fish per cage and a minimum of 3 cages.
- During the wild salmon outmigration (March 1 – Jun 30) aquaculture facilities growing Atlantic salmon must carry out a sea lice abundance assessment every two weeks and report these results monthly
- In Quarters 1, 3 and 4 DFO conducts one sea lice audit per zone on randomly selected Atlantic facilities already chosen for fish health audit, preference is given to second year class fish.
- In Quarter 2 DFO conducts sea lice audits on 50% of all active Atlantic sites during this quarter.
- DFO's sea lice audit include and assessment of industries counting sensitivity, sampling procedures and an audit records.





Conducting Sea Lice Audits



Canada



Field Work

- In 2017 DFO fish health staff conducted 120 fish health audits. Approximately 4 hours are required for a team of 2 – 3 fish health staff to complete a fish health audit.
 - ~1400 man hours on farm/year
 - 850 fresh carcasses were sampled
 - 46 sea lice audits were conducted
 - 124 HMP inspections were performed
- Fish health staff spend approximately 20 days in the field per quarter (80 days per year)
- Aim to perform commercial hatchery inspections within 3 months of proposed transfer
 - At least 25 visits annually



Public Reports

- Fish Health Monitoring Activities Table - Quarterly
- Mortality by Category Zone Level figure – Quarterly
- Mortality by Category Farm Level Table – Quarterly
- DFO Fish Health (zone level) – Quarterly
- Fish Health Farm-Level Audit (E) – Annual (changing to quarterly)
- Fish Health Management Plan Compliance - Annual
- Sea Lice Audit - Quarterly
- Farm Level Industry Sea Lice Report – Monthly
- Sea Lice Exceedance Graph – Monthly/ Quarterly
- Antimicrobial and Slice Use Graph – Annual
- Introduction and Transfer Fish Health Review Report (NEW)



Research Collaborations

- Data supporting ICES expert group on pathology and diseases of marine organisms
- Risk Assessments in response to Cohen Commission
- CSAS project associated with a larger Genome BC project: Strategic Salmon Health Initiative (SSHI)
 - Fluidigm BioMark platform: Evaluation to assess fitness for purpose in microbial monitoring
- Characterization of east coast and west coast *Moritella viscosa* isolates and development of a vaccine for winter ulcer disease
- Data collection for *Neoparamoeba perurans* incidence in BC



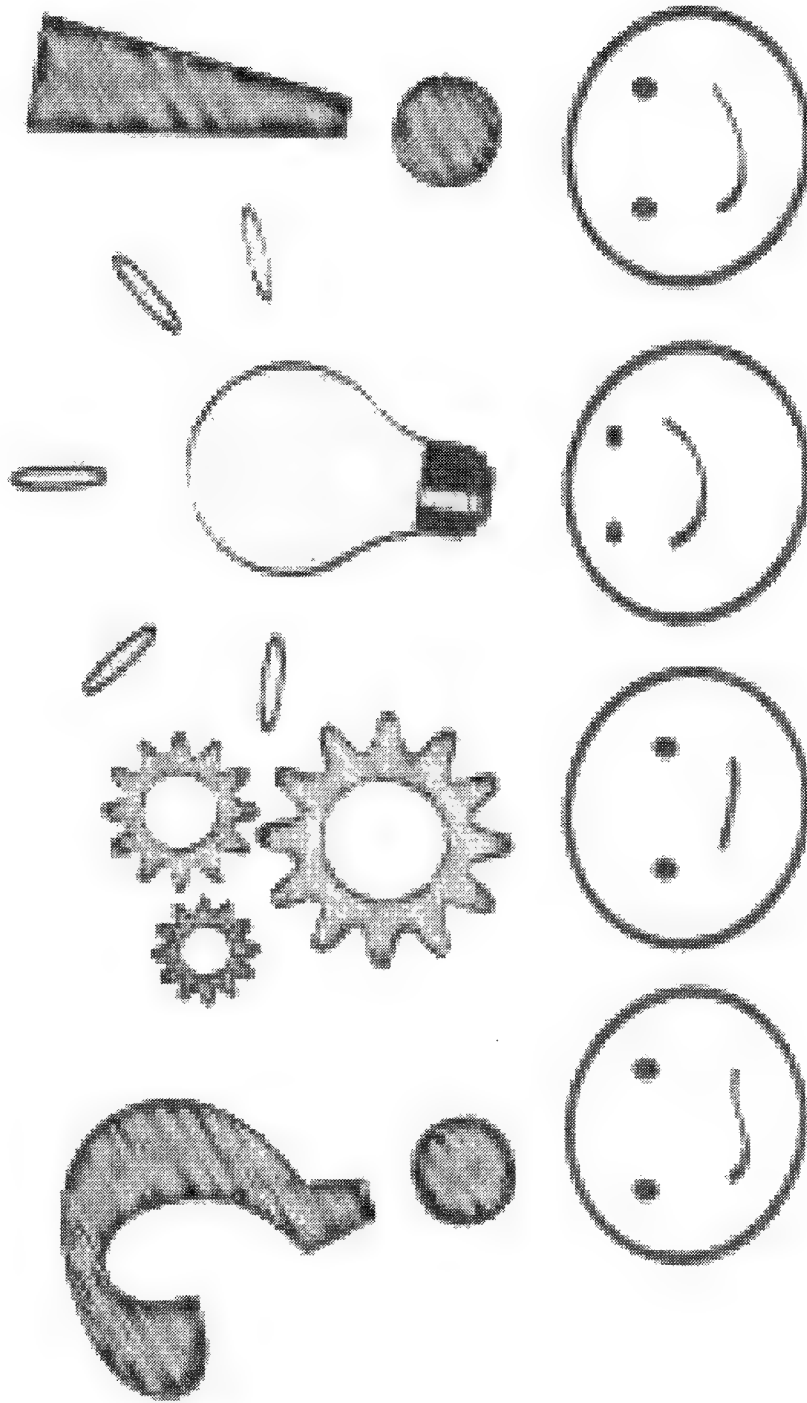


Priorities Going Forward

- Development of defined program goals, and SMART objectives
- Improved public reporting (e.g. infographics)
- Development of freshwater audit program
- Revision of sea lice auditing function
- Increased collaboration and data-sharing with CFIA
- Improved epidemiologic analysis of data
- Implementation of audit recommendations (Ausvet and OAG)
- Improved database and GIS capabilities (see <https://www.barentswatch.no/en/>)
 - Syndromic surveillance
 - Direct reporting by industry
 - Integration of wild fish data
 - Spatial and temporal presentation of data



Questions???????





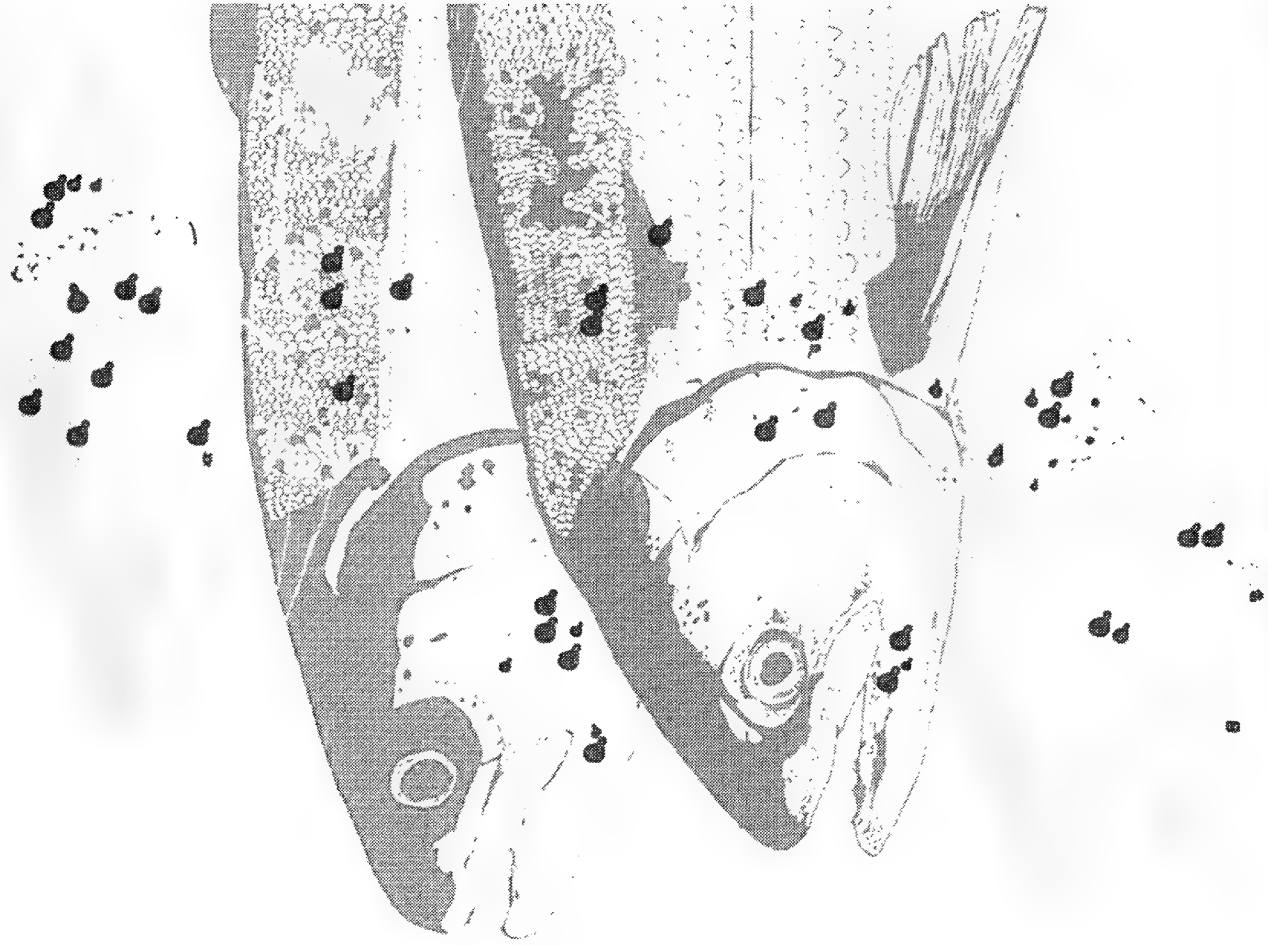
Fisheries and Oceans
Canada

Pêches et Océans
Canada

Sea Lice Cometh

BCARP 2019

Zac Waddington



AQUACULTURE
MANAGEMENT



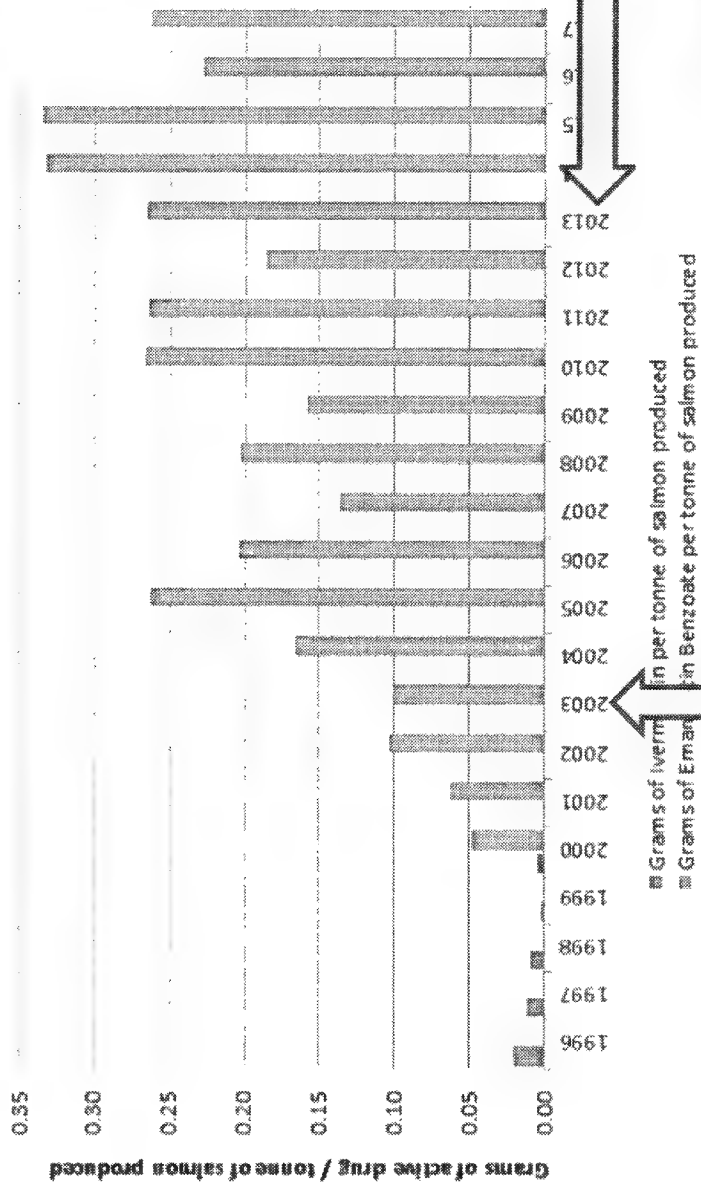
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Canada

Pêches et Océans
Canada

SLICE Use in BC

- SLICE used exclusively as sea lice management tool from 2000-2014

Use of in-feed anti-lice therapeutants in BC salmon aquaculture
1996 - 2017



3 motile threshold
established

ONE TRICK PONY



Paramove
(hydrogen
peroxide) first
licensed in 2013
in Klemtu; fully
licensed in 2015

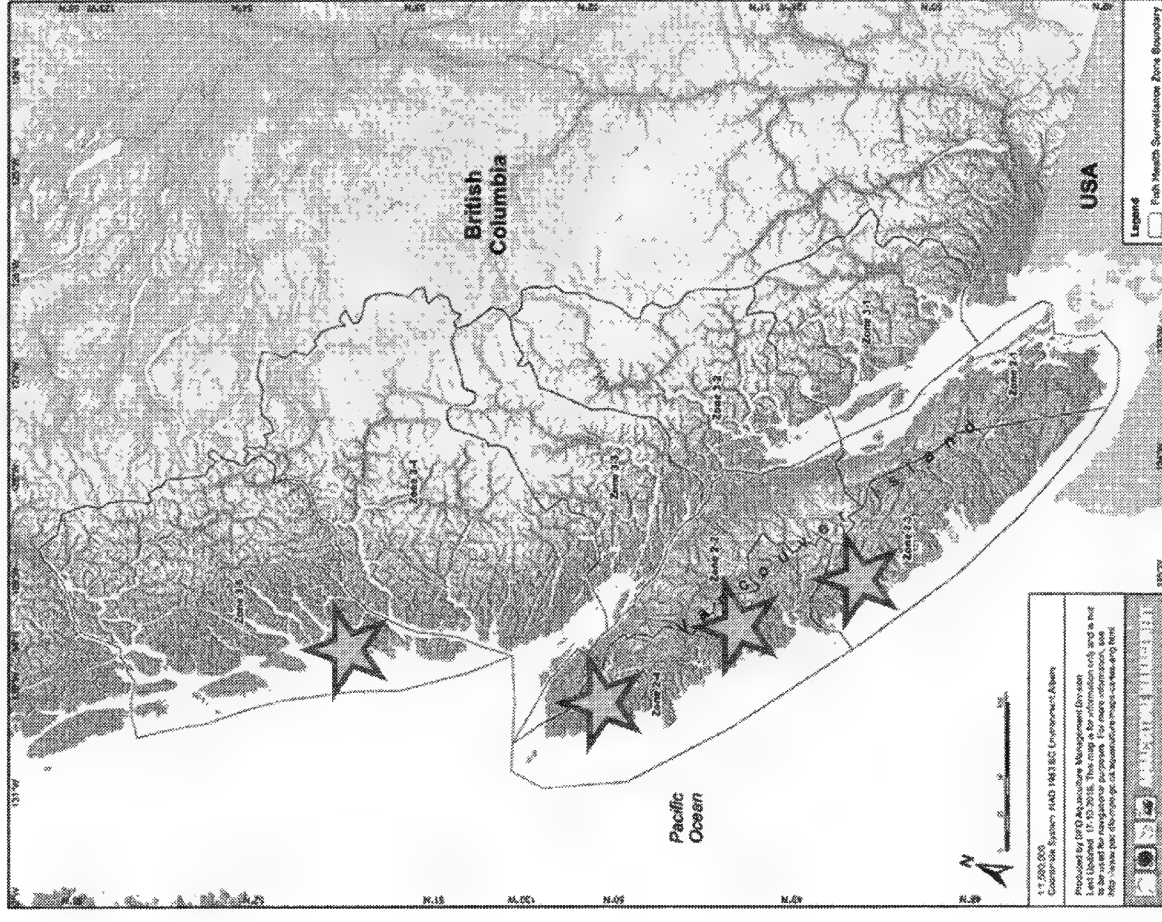


AQUACULTURE
MANAGEMENT



Problem

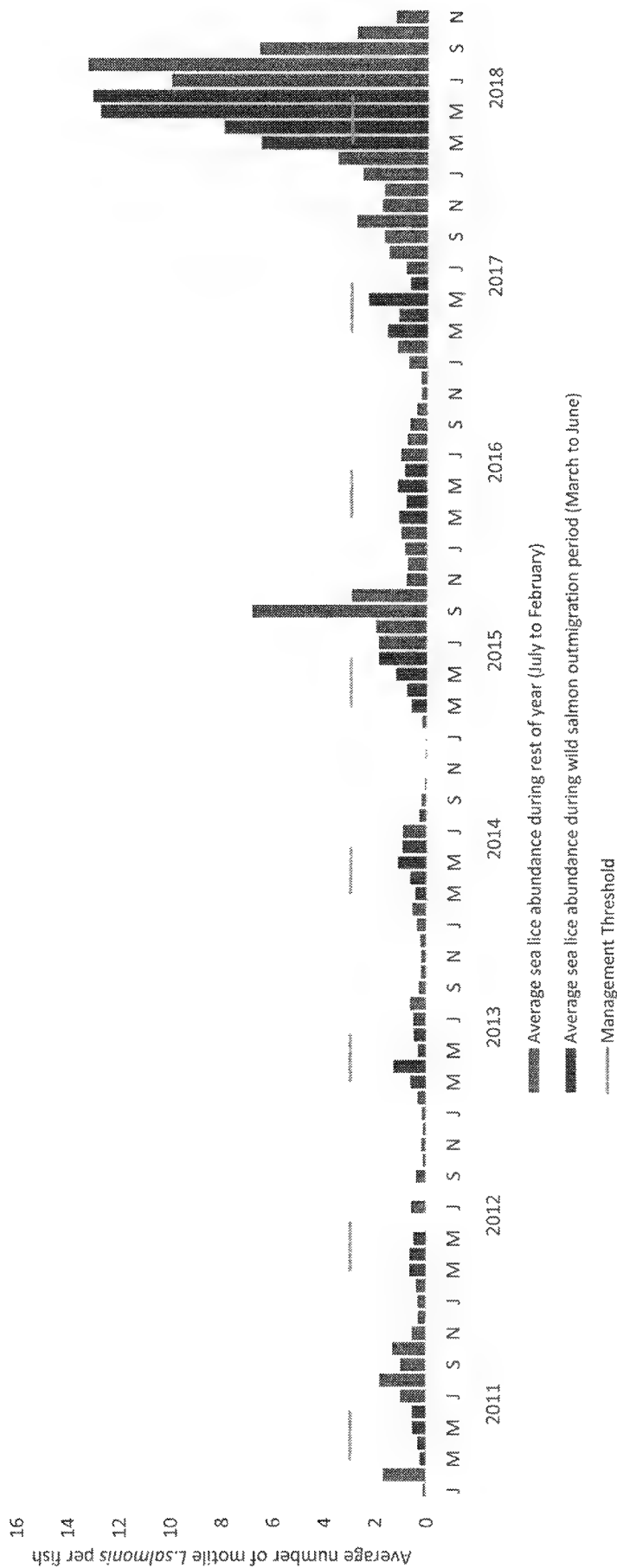
- North Pacific basin only area of world without widespread SLICE resistance.....
- Resistance emerged in Atlantic in mid-2000's and quickly spread to every salmon farming region
 - Genetic resistance now established in farmed and wild Atlantic salmon populations (no known fitness cost)
- SLICE (emamectin benzoate) resistance documented in many areas
 - Klemtu- 2013
 - Quatsino- 2014
 - Esperanza- 2016-2017
 - Clayoquot- 2018





Clayoquot Sound 2018

Sea Lice Abundance at BC Salmon Farms in Fish Health Zone 2-3, 2011 to 2018

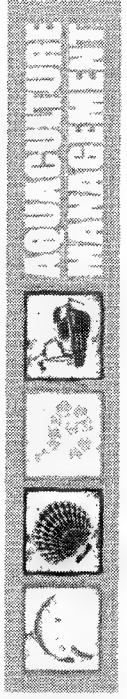
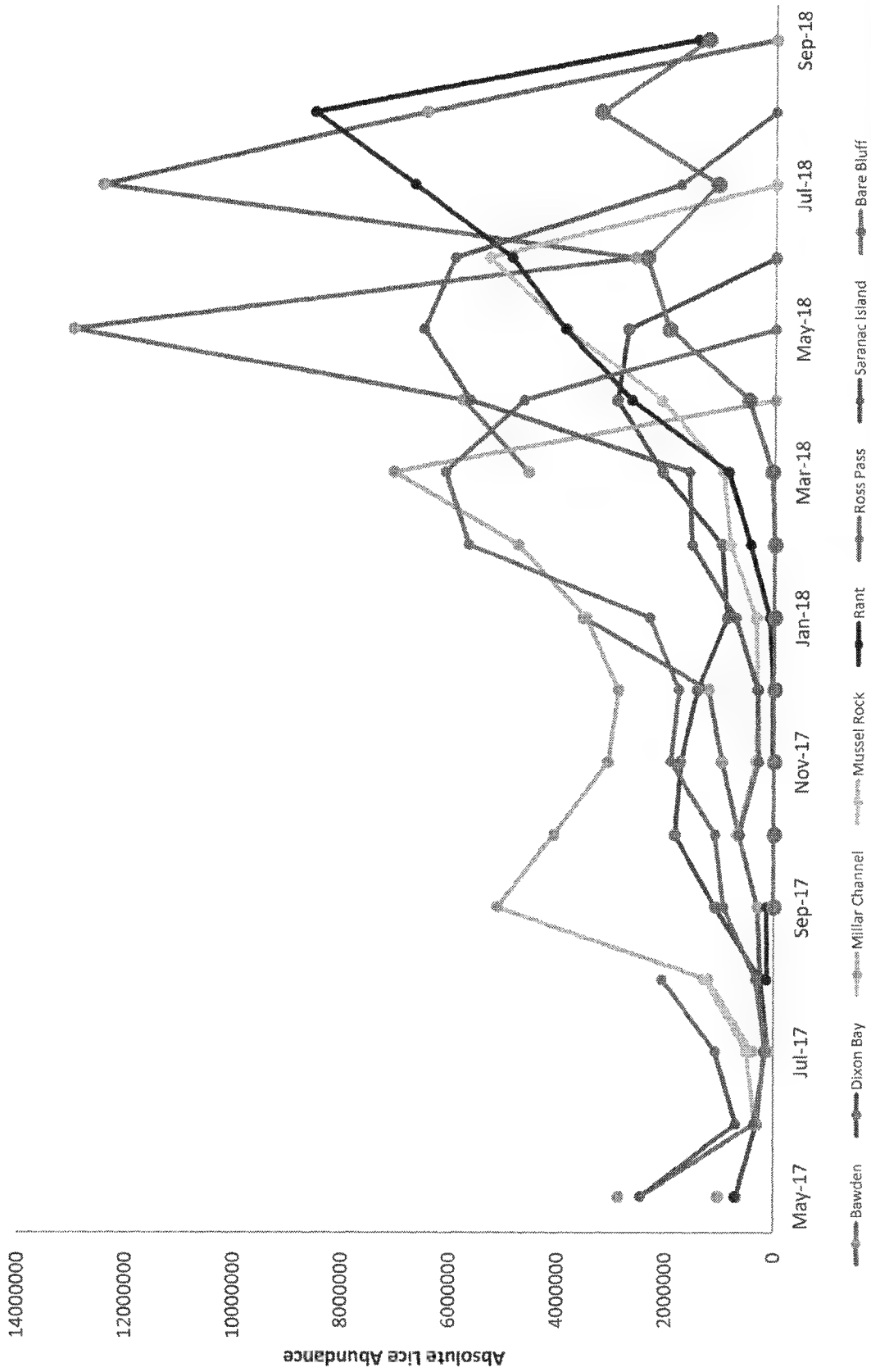




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Canada

CLAYOQUOT SOUND 2018 - Total Motile Lice on Farm





Fact Check

- Living Oceans report published Oct. 2018
 - “it will soon be the case that sea lice cannot be controlled with SLICE™ at any B.C. open netpen salmon farm.”
 - “One to three lice can kill juvenile salmon.”
 - “The advent of drug-resistant sea lice takes BC into an entirely new regime of lice management, in which toxic chemicals will be dumped into the ocean”
 - “For chum salmon, 60 percent were infected with more than 2 lice.”

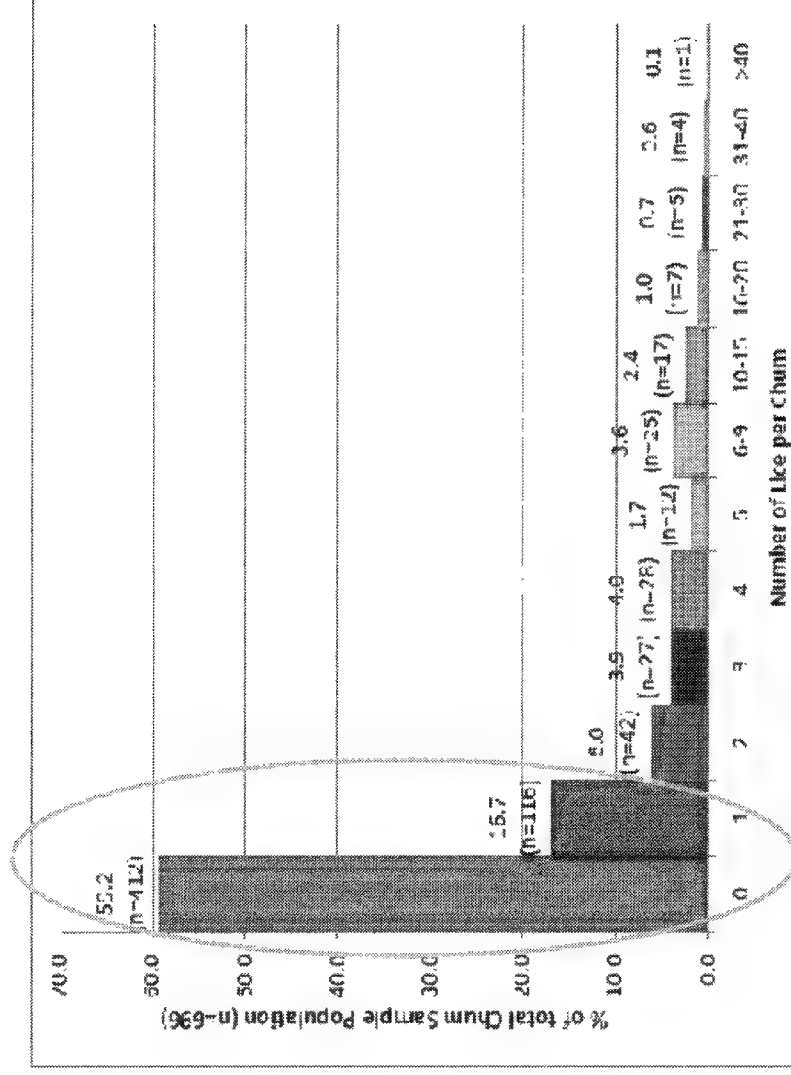


Figure 5: The number of sea lice per chum salmon graphed as a percentage of the total chum sample population collected in Clayoquot Sound in 2018.

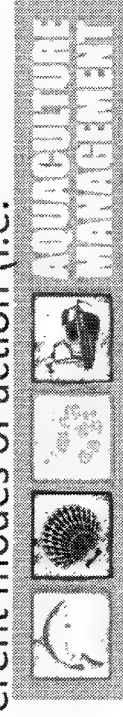




Pest Resistance



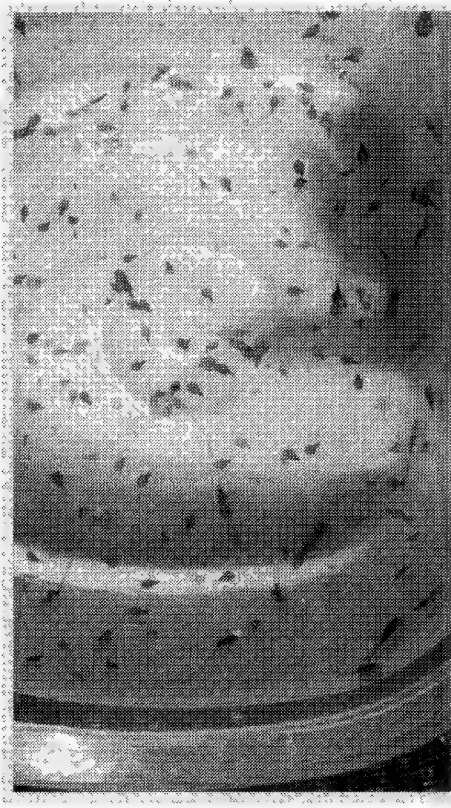
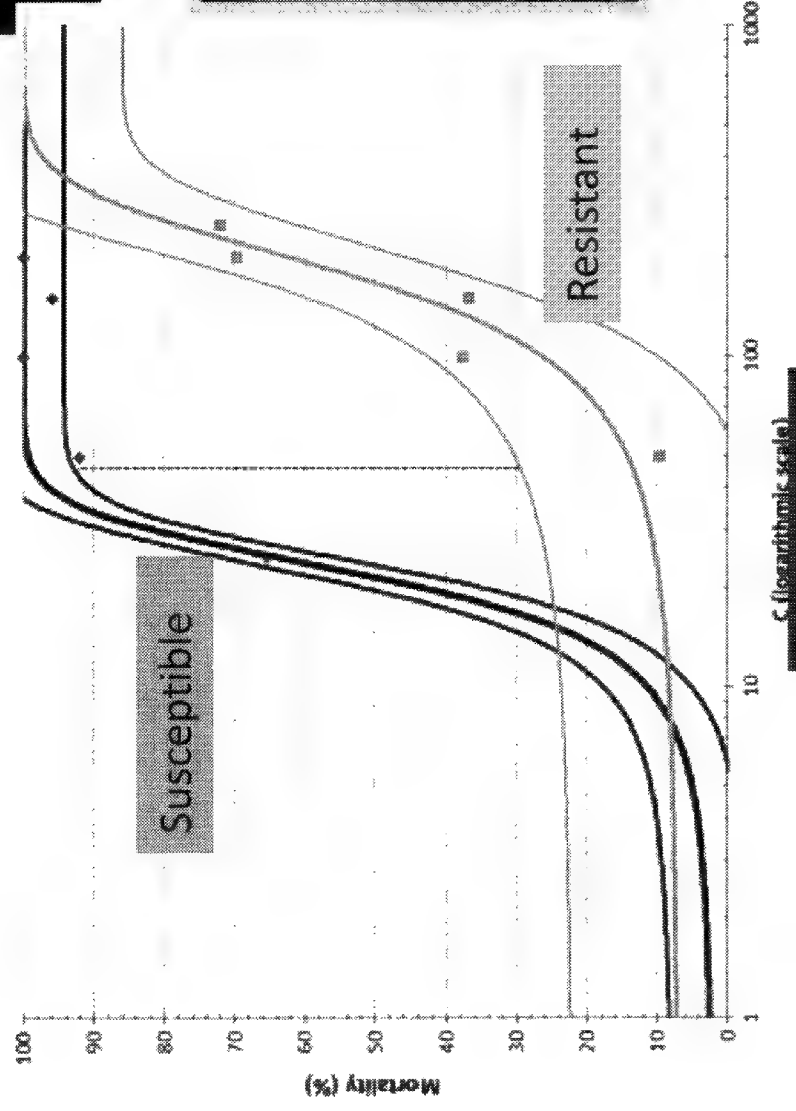
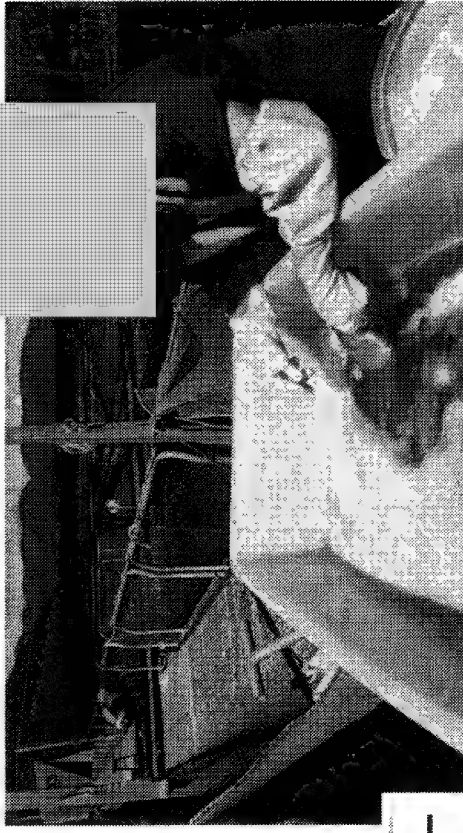
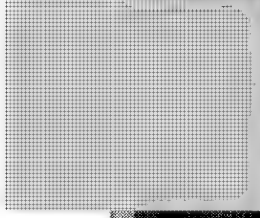
- Evolution in action!
- Resistance: decreased susceptibility of an organism to a given drug/chemical
- Sea lice have been known to develop resistance to all treatment modalities: SLICE, organophosphates, pyrethroids, peroxide and even fresh water
- Resistance evolves quickly in the face of selection pressure
- Stable in a population if no fitness cost
- Risk factors:
 - Exposure to sub-therapeutic dosing; Eg. insufficient dose, insufficient treatment duration, disparate feeding, lack of ABM
 - Increased frequency of exposure
- Prevention:
 - Appropriate treatment dose, course and consideration of subsequent lice exposure
 - *Refugia*: maintain susceptible population by avoiding exposure to drug
 - Goal is never no parasites!!----Cautionary tale in Norway
 - Wild salmon refugia>>>than # of farmed salmon
 - Rotational/combined use of parasiticides with different modes of action (i.e. Integrated Pest Management)





Measuring Resistance

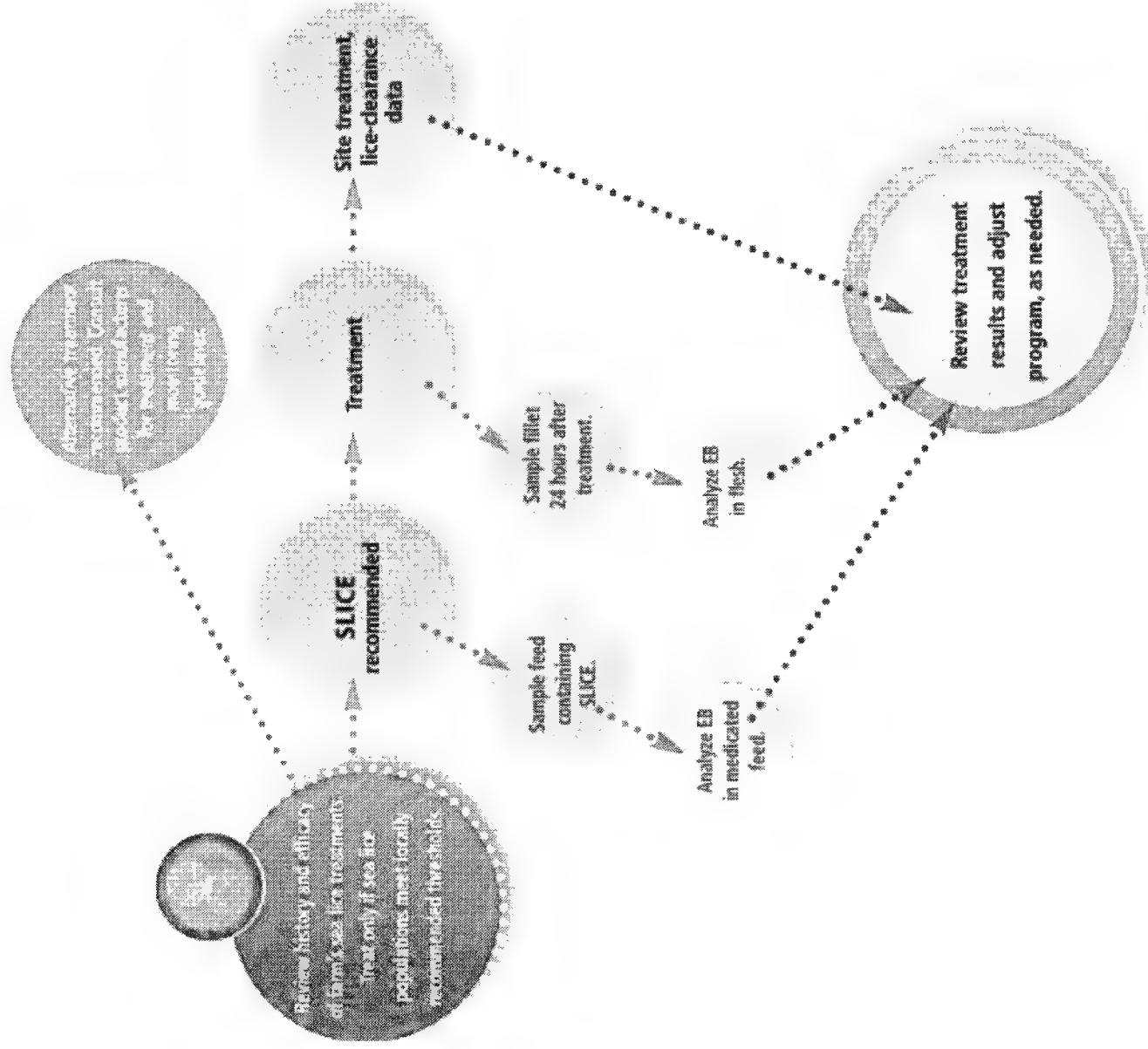
- Bioassay is mainstay
 - >120 lice required
 - Subjective interpretation and labour intensive
 - Not always reliable (inducible resistance)





SSP

- MSP's Slice Sustainability Project outlines best practices to ensure SLICE efficacy and combat resistance developing
- Advise "Strategic rotation programs, diagnostics, fallowing between production cycles, all-in/all-out single-year class stocking policies, coordinated area-wide treatments, and biological controls (wrasse)..."
- Generally adhered to by industry veterinarians





Integrated Pest Management

- Core elements include:
 - Prevention
 - Monitoring
 - Thresholds for Action
 - Management Tools

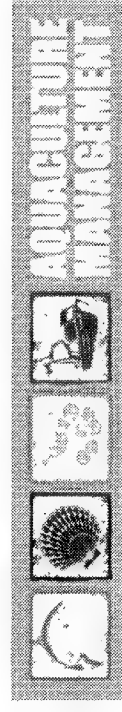


Biological

Physical/Mechanical

Cultural/Sanitation

Prevention



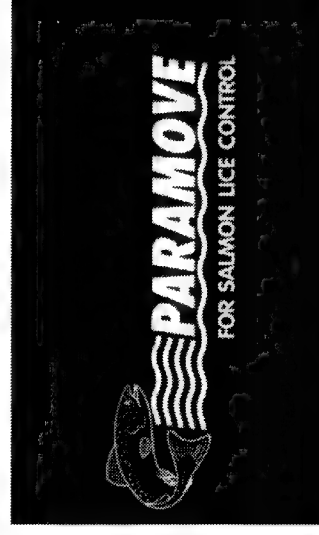
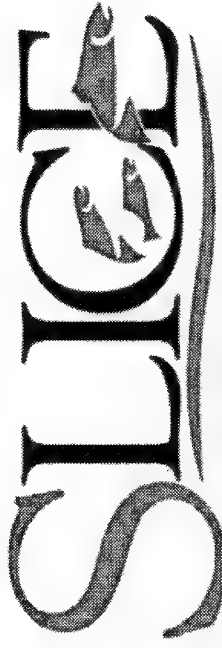


Fisheries and Oceans
Canada

Pêches et Océans
Canada

Drugs

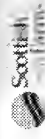
Product	Application Method	Status of Treatments: R&D or In Use	
		British Columbia	Other Countries
Aqui-S (active ingredient eugenol)	Bath	NOT CURRENTLY AVAILABLE	In Use: New Zealand, Australia, USA, Chile, Norway
Ekto-bath/Calicide (active ingredient teflubenzuron)	In-feed	NO LONGER AVAILABLE	In Use: Ireland (partial), Norway, Eastern Canada, Faroe Islands
Excis/Betamax (active ingredient cypermethrin)	Bath	NOT CURRENTLY AVAILABLE	In Use: Chile, Ireland (partial), Scotland, Norway, Tasmania, USA, Tasmania, Eastern Canada, Faroe Islands
Alphamax (active ingredient deltamethrin)	Bath	NOT CURRENTLY AVAILABLE	In Use: Chile, Ireland (partial), Scotland, Norway, Tasmania, USA, Faroe Islands
Releaze (active ingredient diflubenzuron)	In feed	NOT CURRENTLY AVAILABLE	In Use: Chile, Norway, Tasmania, Faroe Islands
IMVIXA (lufenuron)	In feed for freshwater	NOT CURRENTLY AVAILABLE	In Use: Chile
Salmonsan (active ingredient azamethiphos)	Bath	NOT CURRENTLY AVAILABLE	In Use: Eastern Canada, Chile, Ireland (partial), Scotland, Norway, Tasmania, Faroe Islands
SUCE® (active ingredient emamectin benzoate)	In feed	IN USE	In Use: Canada, Chile, Ireland, Scotland, Norway, Tasmania, USA, Faroe Islands
Interlox Paramove 50 (active ingredient hydrogen peroxide)	Bath	IN USE AT PERMITTED SITES	In Use: Canada, Chile (partial), Ireland, Scotland, Norway, Tasmania, USA, Faroe Islands





Alternate Tools

Tool	Application Method	Status of Tools: Requires R&D or In Use	
		British Columbia	Other Countries
 Life slits  Deep  The  S  In  Cool	On site	R&D	In Use: Ireland, Scotland, Norway
	Cleaner fish	Co-culture	In Use: Ireland, Scotland, Faroe Islands, Norway, east coast of Canada
	Resistant broodstock selection	Genetic mapping	In Use: Norway
	Facility siting	On site	In Use: All
	Dispersal models	Area Based Management	Under development in most jurisdictions

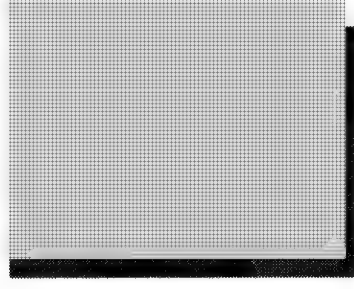




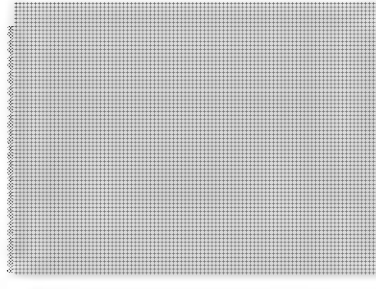
Future Directions

- Improved CoL
- Reporting/tracking of resistance in BC
- Identify genetic basis of resistance in Pacific lice
- Models and past experience demonstrate that large refugia should prevent resistance establishing in BC lice
- Epi project to determine risk factors for SLICE resistance
- Novel treatment/husbandry practices
- Area-based management

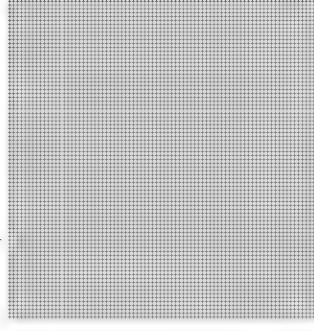
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University
of Victoria



CFIA-ACIA

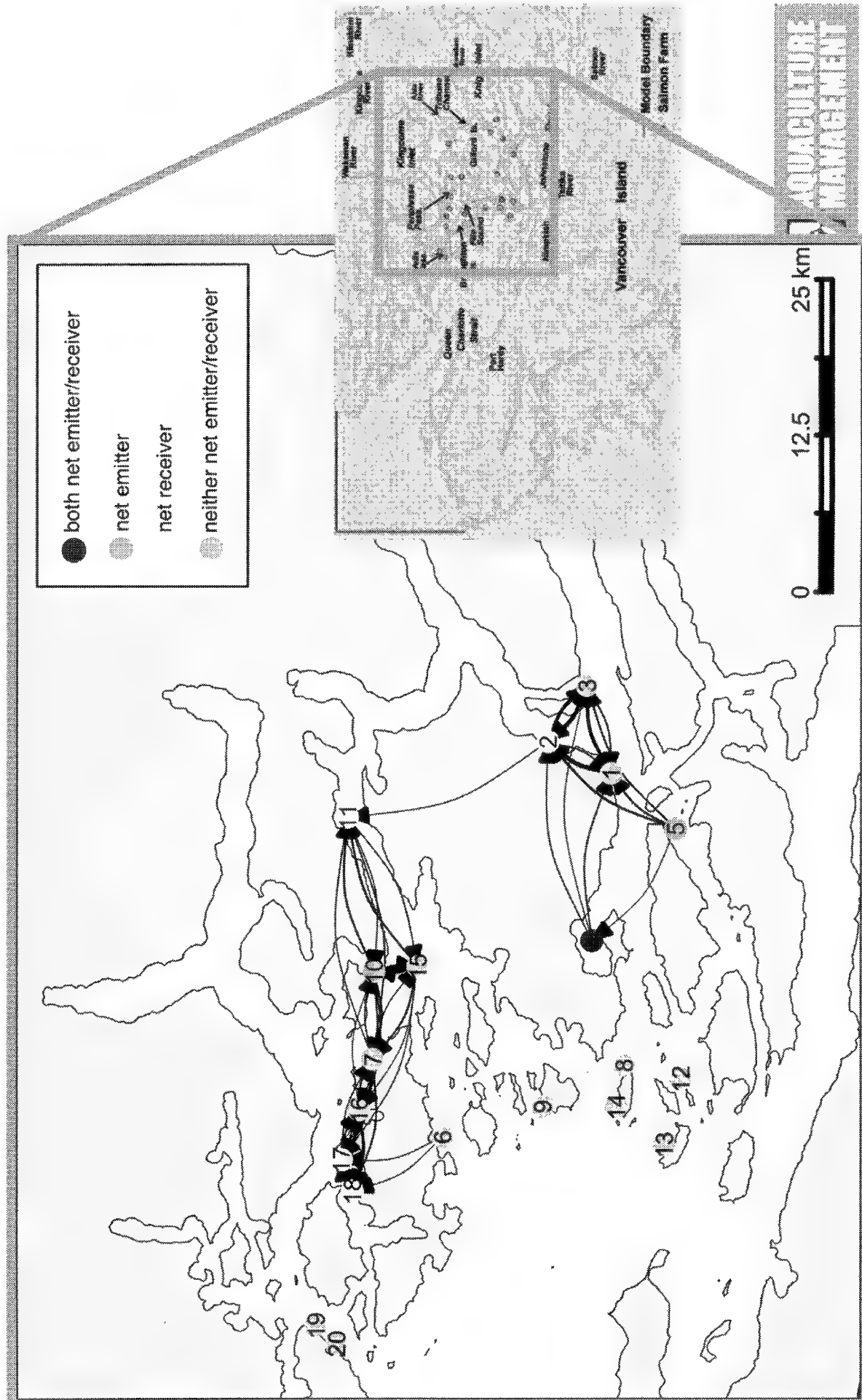


Fisheries and Oceans
Canada





Future Directions- Area Based Mgmt



Maley, Shelley

From: Paylor, Adrienne
Sent: March-01-19 4:40 PM
To: Patirana, Anoma; Waddington, Zac
Subject: FW: Event Report - Issuance of Warning Letter to Cermaq Canada Ltd.
Attachments: ML_AQUA_SealIceClayoquot.doc

Importance: High

Sorry I didn't realize Zac wasn't cc'ed on this so I was waiting for his comments before I responded. I don't think anything needs to be corrected in the attached just cleaned up a bit to remove duplication.

Maybe we could say we are reviewing our sea lice management approach or something more generic? Zac can you take a quick read to confirm this is all still accurate bullets in the attached?

Thx Adrienne

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To: Paylor, Adrienne
Subject: FW: Event Report - Issuance of Warning Letter to Cermaq Canada Ltd.
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Sent: March-01-19 2:21 PM
To: Davies, Leri <Leri.Davies@dfo-mpo.gc.ca>; Girouard, Louise <Louise.Girouard@dfo-mpo.gc.ca>
Cc: Patirana, Anoma <Anoma.Patirana@dfo-mpo.gc.ca>; Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>; Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>
Subject: RE: Event Report - Issuance of Warning Letter to Cermaq Canada Ltd.

Hi,

I am away Mon-Wed next week. I don't think this will come up while I'm gone but if it does we already have lines (attached). We can add that C&P has reviewed the incident and issued a warning letter to the company. Aquaculture program, can you please provide info on whether there are plans to update COLs to better address compliance on sea lice in future?

Thanks,
Michelle

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To: Girouard, Louise <Louise.Girouard@dfo-mpo.gc.ca>
Cc: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Subject: FW: Event Report - Issuance of Warning Letter to Cermaq Canada Ltd.

s.19(1)

s.21(1)(b)

FYI – Best, Leri

From: Doucette, Claire <Claire.Doucette@dfo-mpo.gc.ca>

Sent: 2019–March-01 1:09 PM

To: DFO.F PAC CP Area Chiefs / Chefs de Secteur CP PAC F.MPO <DFO.FPACCPAreaChiefs-ChefsdeSecteurCPPACF.MPO@dfo-mpo.gc.ca>; XPAC OPS/SDC Members <PACSDCMembers@dfo-mpo.gc.ca>

Cc: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>; Davies, Leri <Leri.Davies@dfo-mpo.gc.ca>; Knight, Joe <Joe.Knight@dfo-mpo.gc.ca>; Tomlinson, Daniel <Daniel.Tomlinson@dfo-mpo.gc.ca>; Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>; Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>; Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>; Ballard, Michael <Michael.Ballard@dfo-mpo.gc.ca>

Subject: Event Report - Issuance of Warning Letter to Cermaq Canada Ltd.

Claire Doucette

Chief Aquaculture | Chef de secteur aquaculture

Conservation and Protection | Conservation et Protection

Pacific Region | Région du Pacifique

Fisheries and Oceans Canada | Pêches et Océans Canada

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MEDIA LINES

Sea Lice in Clayoquot

Approved by MinO October 30, 2018

- Seasonal and year-to-year variations in environmental parameters (eg. ocean salinity and temperature) and the number and species composition of wild salmon returns to an area are known to influence the abundance of sea lice on farms.
- In Clayoquot sound over the winter/spring of 2017-2018, the typical drop in salinity that comes with rains did not occur. This higher salinity resulted in increased lice production in the region and exacerbated the lice levels on farms.
- Earlier this year, Fisheries and Oceans Canada (DFO) collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance.
- The Department also initiated a review, which is still ongoing, of Cermaq Canada's sea lice management practices in this region to determine if relevant licence conditions have been followed appropriately.
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities.
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.
- During most years, more than 90% of sites in BC are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). However, there were documented failures of SLICE treatment at Klemtu in 2013 and Esperanza Inlet in 2017 and now Clayoquot Sound in 2018.
- DFO is keeping a close eye on the issue of SLICE resistance. Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

About SLICE and hydrogen peroxide treatments:

- Salmon farming companies use an in-feed therapeutic called SLICE (emamectin benzoate) to reduce lice abundance. In British Columbia to date, SLICE has generally been a very effective tool in the management of sea lice at salmon farms.
- The rotational use of hydrogen peroxide with SLICE on farms is a key component of Integrated Pest Management (IPM). IPM aims to control pests with minimal reliance on drugs/pesticides and prevent

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Created on: 14-Jun-18
Created by: Hélène Taché
Docket #:

Last saved by: DFO-MPO
Revised: 8-Nov-18 3:53 PM

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the development of resistance.

- Hydrogen peroxide is widely used on Canada's east and west coasts to remove sea lice from cultured fish. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment, causing no discernible far-field effect.

Issue: Reporter [REDACTED] has been in contact with the Department regarding a recent report from Living Oceans about the increase in Sea Lice resistance on the BC Coast. Reporter was sent earlier set of MINO approved lines, but has come back with additional questions.

Recommendation: Provide the following QA's to the reporter by email.

Approved by: Adrienne Paylor, Zac Waddington, Allison Webb, Andrew Thompson, Louise Girouard

Questions and Answers:

Q: The report states that sea lice are "out of control" at salmon farms on the west coast of B.C. this year because they have become drug resistant. Is this statement true?

- Sea lice levels were above threshold in a majority of Atlantic salmon sites (11 total) in the Clayoquot region during the 2018 outmigration period. In the rest of BC, only three sites had relatively brief and minor periods where lice levels were over the threshold during this same period.
- DFO regulators have watched carefully for indication of SLICE resistance.
- Ineffective SLICE treatment is not necessarily due to resistance. It may be a result of: poor feed uptake, poor timing of treatment and/or environmental events (including low dissolved oxygen, harmful algal blooms, weather events etc.) which prevent a proper feeding. Prior to 2017, more than 95% of SLICE treatments in the Clayoquot area were considered to be effective.
- In regions where ineffective SLICE treatment has emerged, in the past it has been able to be reversed by a period of discontinuing SLICE use and an introduction of genetically different lice from wild fish. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath). Please contact Cermaq or the Province of BC's Ministry of Environment for further information on this process.
- DFO has been working with the province of BC and industry to develop alternative tools to manage sea lice. New treatment methodology, and husbandry practices are becoming widely adopted along the coast, which are reducing the reliance on SLICE to manage lice at sites. Some examples include: mechanical removal technologies (eg. hydrolizer), hydrogen peroxide treatment, area-based management (eg. coordinated treatments, stocking and fallowing of sites in an area) and pre-treatment of smolts in the hatchery with anti-louse medication. The rotational use of these technologies is part of an Integrated Pest Management approach, which has been demonstrated to reduce the need for drugs/pesticides, and prevent the development of resistance.

Q: The report claims Fisheries and Oceans Canada knew as early as 2014 that resistance was developing in sea lice, but did not take measures to ensure the protection of wild juvenile salmon from the parasite. Measures could have included alternate treatments for sea lice ready for deployment when SLICE failed. Is this an accurate depiction?

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- DFO regulators have watched carefully for indication of SLICE resistance. DFO has been actively monitoring and analysing sea lice data for indication of SLICE resistance since 2011 and first noted concerns at Klemtu in 2015, Esperanza Inlet in 2017, and now Clayoquot Sound in 2018.
- Since the monitoring numbers in Clayoquot Sound from this spring was the strongest indication of ineffective SLICE treatment to date, DFO took action to perform a targeted audit and collected sea lice samples from Cermaq Canada's Bawden site and sent them to the BC Centre for Aquatic Health Sciences for analysis. SLICE resistance was confirmed by the lab. Samples were later sent to the Atlantic Veterinary College which is currently undertaking work to better understand SLICE resistance.
- DFO has supported the development and licencing of new lice treatment methodologies and continues to work in collaboration with BC and industry to make advancements in this area to address sea lice while minimising environmental impacts and risks to wild fish.
- Some examples include: the licencing for hydrogen peroxide use in BC, research into sea lice eating fish species, development of models to support area-based management, research into risk factors for SLICE resistance, the licencing of *Imvixa* (an in-feed drug used in hatchery to confer up to 9 months protection from sea louse infestation), and funding for implementation of various green technologies on sites.
- In addition, since 2014, industry has made significant investments in mechanical removal technologies (hydrolicer), hosted workshops on Integrated Pest Management techniques, and purchased and ordered well boats to facilitate peroxide and fresh water bath treatments.
- DFO has taken significant action and is currently investigating the management of lice at sites in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions. Due to the active investigation we cannot comment further at this time.

Q: The report claims that DFO has been contacted to comment on these claims, but that a Vancouver Sun reporter never received a response. Cermaq has also been contacted. Neither DFO or Cermaq release public records of the drug treatments used on farmed salmon. Is this true?

- In BC under DFO's Pacific Aquaculture Regulations all infeed treatments are publicly reported in the sea lice abundance reports online.
- In addition, DFO publicly reports the quantity of all drugs and pesticides deposited at each aquaculture facility under the national Aquaculture Activities Regulations (AAR). This information is posted on an annual basis starting in 2016 when the regulation came into effect. The 2017 report is currently being processed for posting. Please see: <http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/apr-rpa-reporting-eng.htm>

Q: Has the Department been withholding information from The Minister of Agriculture's Advisory Council on Finfish Aquaculture (MAACFA)?

- The Minister of Agriculture's Advisory Council on Finfish Aquaculture (MAACFA) is a province of BC led process of which DFO has not been a member, however it has attended a few meetings at the request of the Council to provide responses to specific questions and provided the most up to date available information at that time.
- Sea lice data is posted publicly on DFO's website and is updated regularly for increased transparency. Claims that DFO is deliberately hiding data are untrue.

Issue: [REDACTED] Globe and Mail [REDACTED] She is working on a story about Cermaq closing one of its sites, apparently in relation to sea lice concerns. She has already spoken to Cermaq and has a follow-up question for DFO:
Given the level of sea lice infestations in Clayoquot Sound this year, is DFO doing any additional monitoring or enforcement in the area?

Deadline: Friday, September 21 at 3:00 p.m.

Approved by: Zac Waddington, Adrienne Paylor, Andy Thomson, Bonnie Antcliffe (ARDG Pacific), shared FYI for awareness with JF LaRue, Philippe Morel, Wayne Moore and Arran McPherson

Media lines:

- Fisheries and Oceans Canada (DFO) is confident in the monitoring being done in the Clayoquot area by environmental non-government groups, and third party environmental consultants hired by Cermaq. For this reason, DFO determined that resources could be better directed to furthering research into SLICE resistance (SLICE is approved for use in Canada as an in-feed therapeutant used by the salmon aquaculture industry to manage sea lice. It can only be administered to farmed fish under veterinary prescription).
- DFO is keeping a close eye on the issue of SLICE resistance. The Department collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance.
- During most years, more than 90% of sites in BC are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). However, there were documented failures of SLICE treatment at Klemtu in 2015 and Esperanza Inlet in 2017 and now Clayoquot Sound in 2018.
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

G & M follow-up question: Have there been any OTHER B.C. fish farm sites closed as a result of sea lice concerns in 2018 to date?

Approved by : Bernie Taekema, Brenda McCorquodale, Allison Webb, Jennifer Nener, RDG
FYI to NHQ Oct 3, 2018

s.19(1)

- Under the *Pacific Aquaculture Regulations*, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. approved
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon

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outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**

- DFO has not closed any aquaculture sites due to sea lice concerns; however, the Department has delayed approval of applications to increase production in cases where sea lice levels were above the regulatory threshold. **new**

Issue:

A number of farms in British Columbia's Clayoquot Sound area, all owned by Cermaq Canada, are experiencing extremely high sea lice counts this spring. This has already received media attention and lines have been approved.

Since then, lab tests have confirmed that the sea lice at least one of the farms are resistant to SLICE, which is the chemical treatment most widely used to control sea lice in BC. A "responsive" section has been added to media lines in anticipation of further media requests.

Media lines:

- Fisheries and Oceans Canada (DFO) is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels. **approved**
- The Department is reviewing Cermaq Canada's sea lice management practices at these farms to determine if relevant licence conditions have been followed appropriately. **approved**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**
- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html. **approved**
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath). Please contact Cermaq or the

Province of BC's Ministry of Environment for further information on this process. **approved**

- Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance quickly in the environment and causes no discernible far-field effect. **approved**
- Our fish health veterinarians have requested documentation to determine the appropriateness of treatments undertaken at these farms, and to ensure that all other treatment and harvest options were duly considered by Cermaq. Financial considerations would not be recognized as justification for exclusion of otherwise effective lice management options. **approved**
- This is not a formal investigation under the Fisheries Act or regulations; however, if there has been non-compliance with the licence conditions, DFO will address the matter with an appropriate enforcement response. **approved**

Responsive on SLICE resistance (new)

- DFO collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. **new**
- In BC, SLICE has generally been a very effective tool in the management of sea lice at salmon farms. During most years, more than 90% of sites are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). **new**
- SLICE resistance is an emerging issue in BC, with failures of treatment documented at Klemtu in 2015, Esperanza Inlet in 2017 and now Clayoquot sound in 2018. **new**
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm. **New**
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach. **New**

Program Contacts: Zac Waddington, Simon Jones

Communications Contact: Michelle Rainer

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Maley, Shelley

From: Waddington, Zac
Sent: March-04-19 8:54 AM
To: Paylor, Adrienne; Patirana, Anoma; Rainer, Michelle
Subject: RE: Event Report - Issuance of Warning Letter to Cermaq Canada Ltd.
Attachments: ML_AQUA_SeaLiceClayoquot-ZW edits.doc

Please see the document with my edits. Mostly very minor,

Zac

From: Paylor, Adrienne
Sent: March-01-19 4:40 PM
To: Patirana, Anoma; Waddington, Zac
Subject: FW: Event Report - Issuance of Warning Letter to Cermaq Canada Ltd.
Importance: High

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To: Davies, Leri <Leri.Davies@dfo-mpo.gc.ca>; Girouard, Louise <Louise.Girouard@dfo-mpo.gc.ca>
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s.19(1)

Thanks,

s.21(1)(b)

Michelle

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Sent: March-01-19 2:10 PM
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Cc: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Subject: FW: Event Report - Issuance of Warning Letter to Cermaq Canada Ltd.

FYI – Best, Leri

From: Doucette, Claire <Claire.Doucette@dfo-mpo.gc.ca>
Sent: 2019–March-01 1:09 PM
To: DFO.F PAC CP Area Chiefs / Chefs de Secteur CP PAC F.MPO <DFO.FPACCPAreaChiefs-ChefsdeSecteurCPPACF.MPO@dfo-mpo.gc.ca>; XPAC OPS/SDC Members <PACSDCMembers@dfo-mpo.gc.ca>
Cc: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>; Davies, Leri <Leri.Davies@dfo-mpo.gc.ca>; Knight, Joe <Joe.Knight@dfo-mpo.gc.ca>; Tomlinson, Daniel <Daniel.Tomlinson@dfo-mpo.gc.ca>; Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>; Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>; Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>; Ballard, Michael <Michael.Ballard@dfo-mpo.gc.ca>
Subject: Event Report - Issuance of Warning Letter to Cermaq Canada Ltd.

Claire Doucette
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MEDIA LINES

Sea Lice in Clayoquot

Approved by MinO October 30, 2018

- Seasonal and year-to-year variations in environmental parameters (eg. ocean salinity and temperature) and the number and species composition of wild salmon returns to an area are known to influence the abundance of sea lice on farms.
- In Clayoquot sound over the winter/spring of 2017-2018, the typical drop in salinity that comes with rains did not occur. This higher salinity resulted in increased lice production in the region and exacerbated the lice levels on farms.
- Earlier this year, Fisheries and Oceans Canada (DFO) collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance.
- The Department also initiated a review, which is still ongoing, of Cermaq Canada's sea lice management practices in this region to determine if relevant licence conditions have been followed appropriately.
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities.
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle.
- During most years, more than 90% of sites in BC are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). However, there were documented failures of SLICE treatment at Klemtu in 2013 and Esperanza Inlet in 2017 and now Clayoquot Sound in 2018.
- DFO is keeping a close eye on the issue of SLICE resistance. Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

About SLICE and hydrogen peroxide treatments:

- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In British Columbia to date, SLICE has generally been a very effective tool in the management of sea lice at salmon farms.

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- The rotational use of hydrogen peroxide with SLICE on farms is a key component of Integrated Pest Management (IPM). IPM aims to control pests with minimal reliance on drugs/pesticides and prevent the development of resistance.
- Hydrogen peroxide is widely used on Canada's east and west coasts to remove sea lice from cultured fish. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance (water and oxygen) quickly in the environment, causing no discernible far-field effect.

Issue: Reporter [REDACTED] has been in contact with the Department regarding a recent report from Living Oceans about the increase in Sea Lice resistance on the BC Coast. Reporter was sent earlier set of MINO approved lines, but has come back with additional questions.

Recommendation: Provide the following QA's to the reporter by email.

Approved by: Adrienne Paylor, Zac Waddington, Allison Webb, Andrew Thompson, Louise Girouard

Questions and Answers:

Q: The report states that sea lice are "out of control" at salmon farms on the west coast of B.C. this year because they have become drug resistant. Is this statement true?

- Sea lice levels were above threshold in a majority of Atlantic salmon sites (11 total) in the Clayoquot region during the 2018 outmigration period. In the rest of BC, only three sites had relatively brief and minor periods where lice levels were over the threshold during this same period.
- DFO regulators have watched carefully for indications of SLICE resistance.
- Ineffective SLICE treatment is not necessarily due to resistance. It may be a result of: poor feed uptake, poor timing of treatment and/or environmental events (including low dissolved oxygen, harmful algal blooms, weather events etc.) which prevent a proper feeding. Prior to 2017, more than 95% of SLICE treatments in the Clayoquot area were considered to be effective.
- In regions where ineffective SLICE treatment has emerged, in the past it has been able to be reversed by a period of discontinuing SLICE use and the natural introduction of SLICE naive genetically different lice from wild fish returning to the area. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath). Please contact Cermaq or the Province of BC's Ministry of Environment for further information on this process.
- DFO has been working with the province of BC and industry to develop alternative tools to manage sea lice. New treatment methodology, and husbandry practices are becoming widely adopted along the coast, which are reducing the reliance on SLICE to manage lice at sites. Some examples include: mechanical removal technologies (eg. hydrolicer), hydrogen peroxide treatment, area-based management (eg. coordinated treatments, stocking and fallowing of sites in an area) and pre-treatment of smolts in the hatchery with anti-lice medication. The rotational use of these technologies is part of an Integrated Pest Management approach, which has been demonstrated to reduce the need for drugs/pesticides, and prevent the development of resistance.

Q: The report claims Fisheries and Oceans Canada knew as early as 2014 that resistance was developing in sea lice, but did not take measures to ensure the protection of wild juvenile salmon from the parasite. Measures could have included alternate treatments for sea lice ready for deployment when SLICE failed. Is this an accurate depiction?

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- DFO regulators have watched carefully for indication of SLICE resistance. DFO has been actively monitoring and analysing sea lice data for indication of SLICE resistance since 2011 and first noted concerns at Klemtu in 2013⁵, Esperanza Inlet in 2017, and now Clayoquot Sound in 2018.
- DFO supported and facilitated the licencing of Paramove (hydrogen peroxide) in BC in response to SLICE resistance beginning in 2013.
- Since ~~the reported sea lice monitoring counts numbers~~ in Clayoquot Sound ~~in from this spring 2018~~ represented the most widespread SLICE resistance in BC was the strongest indication of ineffective SLICE treatment to date.
- DFO took action to perform a targeted audit and collected sea lice samples from Cermaq Canada's Bawden site and sent them to the BC Centre for Aquatic Health Sciences for analysis. SLICE resistance was confirmed by the lab. Samples were later sent to researchers at University of Victoria and the Atlantic Veterinary College, who are which is currently undertaking work to better understand SLICE resistance.
- DFO has supported the development and licencing of new lice treatment methodologies and continues to work in collaboration with BC and industry to make advancements in this area to address sea lice while minimising environmental impacts and risks to wild fish.
- Some examples include: the licencing for hydrogen peroxide use in BC, research into sea lice eating cleaner fish species, development of models to support area-based management, research into risk factors for SLICE resistance, the licencing of Imvixa (an in-feed drug used in hatchery to confer up to 9 months protection from sea louse infestation), and funding for implementation of various green technologies on sites.
- In addition, since 2014, industry has made significant investments in mechanical removal technologies (hydrolicer), hosted workshops on Integrated Pest Management techniques, and purchased and ordered well boats to facilitate peroxide and fresh water bath treatments.
- DFO has taken significant action and is currently investigating the management of lice at sites in Clayoquot by Cermaq Canada to determine if there has been non-compliance with the licence conditions. Due to the active investigation we cannot comment further at this time.

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Q: The report claims that DFO has been contacted to comment on these claims, but that a Vancouver Sun reporter never received a response. Cermaq has also been contacted. Neither DFO or Cermaq release public records of the drug treatments used on farmed salmon. Is this true?

- In BC under DFO's Pacific Aquaculture Regulations all infeed treatments are publicly reported in the sea lice abundance reports online.
- In addition, DFO publicly reports the quantity of all drugs and pesticides deposited at each aquaculture facility under the national Aquaculture Activities Regulations (AAR). This information is posted on an annual basis starting in 2016 when the regulation came into effect. The 2017 report is currently being processed for posting. Please see: <http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/apr-rpa-reporting-eng.htm>

Q: Has the Department been withholding information from The Minister of Agriculture's Advisory Council on Finfish Aquaculture (MACCFA)?

- The Minister of Agriculture's Advisory Council on Finfish Aquaculture (MAACFA) is a province of BC led process of which DFO has not been a member, however it has attended a few meetings at the

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request of the Council to provide responses to specific questions and provided the most up to date available information at that time.

- Sea lice data is posted publicly on DFO's website and is updated regularly for increased transparency. Claims that DFO is deliberately hiding data are untrue.

Issue: [REDACTED] Globe and Mail [REDACTED] She is working on a story about Cermaq closing one of its sites, apparently in relation to sea lice concerns. She has already spoken to Cermaq and has a follow-up question for DFO:
Given the level of sea lice infestations in Clayoquot Sound this year, is DFO doing any additional monitoring or enforcement in the area?

Deadline: Friday, September 21 at 3:00 p.m.

Approved by: Zac Waddington, Adrienne Paylor, Andy Thomson, Bonnie Antcliffe (A/RDG Pacific), shared FYI for awareness with JF LaRue, Philippe Morel, Wayne Moore and Arran McPherson

Media lines:

- Fisheries and Oceans Canada (DFO) is confident in the monitoring being done in the Clayoquot area by environmental non-government groups, and third party environmental consultants hired by Cermaq. For this reason, DFO determined that resources could be better directed to furthering research into SLICE resistance (SLICE is approved for use in Canada as an in-feed therapeutic used by the salmon aquaculture industry to manage sea lice. It can only be administered to farmed fish under veterinary prescription).
- DFO is keeping a close eye on the issue of SLICE resistance. The Department collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance.
- During most years, more than 90% of sites in BC are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). However, there were documented failures of SLICE treatment at Klemtu in 2015 and Esperanza Inlet in 2017 and now Clayoquot Sound in 2018.
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm.
- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach.

G & M follow-up question: Have there been any OTHER B.C. fish farm sites closed as a result of sea lice concerns in 2018 to date?

Approved by : Bernie Taekema, Brenda McCorquodale, Allison Webb, Jennifer Nener, RDG
FYI to NHQ Oct 3, 2018

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- Under the *Pacific Aquaculture Regulations*, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. approved
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. approved
- DFO has not closed any aquaculture sites due to sea lice concerns; however, the Department has delayed approval of applications to increase production in cases where sea lice levels were above the regulatory threshold. new

Issue:

A number of farms in British Columbia's Clayoquot Sound area, all owned by Cermaq Canada, are experiencing extremely high sea lice counts this spring. This has already received media attention and lines have been approved.

Since then, lab tests have confirmed that the sea lice at least one of the farms are resistant to SLICE, which is the chemical treatment most widely used to control sea lice in BC. A "responsive" section has been added to media lines in anticipation of further media requests.

Media lines:

- Fisheries and Oceans Canada (DFO) is aware of the sea lice exceedances at Cermaq Canada's facilities in Clayoquot and has been in ongoing discussions with the company since January 2018 about measures to reduce sea lice levels. approved
- The Department is reviewing Cermaq Canada's sea lice management practices at these farms to determine if relevant licence conditions have been followed appropriately. approved
- Under the *Pacific Aquaculture Regulations*, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. approved
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. approved

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- DFO makes reports on the numbers of sea lice at BC aquaculture farms available to the public at www.dfo-mpo.gc.ca/aquaculture/protect-protege/parasites-eng.html. **approved**
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In cases where the use of SLICE does not result in adequate reduction of sea lice, companies can apply to the province of British Columbia for a permit to use alternative treatments, including Paramove (a hydrogen peroxide bath). Please contact Cermaq or the Province of BC's Ministry of Environment for further information on this process. **approved**
- Hydrogen peroxide is widely used around the world, including elsewhere on Canada's west coast, with excellent effect and no demonstrable effects to the ecosystem. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance (water and oxygen) quickly in the environment and causes no discernible far-field effect. **approved**
- Our fish health veterinarians have requested documentation to determine the appropriateness of treatments undertaken at these farms, and to ensure that all other treatment and harvest options were duly considered by Cermaq. Financial considerations would not be recognized as justification for exclusion of otherwise effective lice management options. **approved**
- This is not a formal investigation under the Fisheries Act or regulations; however, if there has been non-compliance with the licence conditions, DFO will address the matter with an appropriate enforcement response. **approved**

Responsive on SLICE resistance (new)

- DFO collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. **new**
- In BC, SLICE has generally been a very effective tool in the management of sea lice at salmon farms. During most years, more than 90% of sites are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). **new**
- SLICE resistance is an emerging issue in BC, with failures of treatment documented at Klemtu in 2013⁵, Esperanza Inlet in 2017 and now Clayoquot sound in 2018. **new**
- Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm. **New**

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- DFO is also supporting the licensing and approval process for alternative sea lice treatments, which are a necessary part of an integrated pest management approach. **New**

Program Contacts: Zac Waddington, Simon Jones

Communications Contact: Michelle Rainer

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Maley, Shelley

From: Waddington, Zac
Sent: March-06-19 12:00 PM
To: McCorquodale, Brenda
Cc: Paylor, Adrienne
Subject: RE: Letter to Brenda McCorquodale re 2019 mgmt
Attachments: Letter to Brenda McCorquodale re 2019 mgmt-ZW edits.docx

Please see the attached letter with my comments. Let me know if you need anything else,

Zac

From: McCorquodale, Brenda
Sent: March-06-19 9:41 AM
To: Waddington, Zac
Cc: Paylor, Adrienne
Subject: RE: Letter to Brenda McCorquodale re 2019 mgmt

Hi Zac

I don't think I heard back from you on this one – are you able to insert some notes in that we could use for a response as a part of setting up a meeting? I also would like to confirm some dates you might be available. Did you get that other email?

Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des peches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

From: McCorquodale, Brenda
Sent: Tuesday, February 26, 2019 7:06 PM
To: Waddington, Zac
Cc: Patirana, Anoma
Subject: FW: Letter to Brenda McCorquodale re 2019 mgmt

Hi Zac – any thoughts on a response to the sections relevant to your work? You could insert them in here and then I will collate into a proposed response. We want to respond prior to meeting with them.

Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des pêches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

From: Shaw, Kerra
Sent: Monday, February 18, 2019 12:26 PM
To: Paylor, Adrienne; McCorquodale, Brenda
Subject: Letter to Brenda McCorquodale re 2019 mgmt

In case you need this.

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pages 143 to / à 148**

Maley, Shelley

From: Manchester, Howie
Sent: March-08-19 7:29 AM
To: Shaw, Kerra; Waddington, Zac; McConnachie, Sarah
Subject: RE: Goat Cove review time saver!

Hi Kerra,

Yes, thank you, I saw this as well and considered Sonja's review in the updated amendment review for Goat.

I have written up an updated summary similar to the one we did for Lutes and passed it on to Zac for review, we should be able to use this to update the SRAR for Goat early next week.

Howie

From: Shaw, Kerra
Sent: March-07-19 4:53 PM
To: Waddington, Zac; McConnachie, Sarah; Manchester, Howie
Subject: Goat Cove review time saver!
Importance: High

Just noticed that we did a review of the same amendment at Goat Cove in 2015. Sonja did an assessment of this exact same amendment.

I'll send you her assessment – please feel free to tweak this or update as you see fit. But it should save a bit of time!

Fish Health: (provided by Sonja Saksida)

This assessment was conducted for all 6 existing salmon farms in the Klemtu area.

Evaluation of fish health reporting from the other farms located in the area [REDACTED] in harvest size fish in November 2014.

s.20(1)(b)

[REDACTED] Summer blooms and pelagic invertebrates (for example, jellyfish) are included in the differentials. The temperatures have been higher these past couple of years which puts environmental high in the list, and the presentation seems to be different here than further south. In 2013, unidentified crustaceans were observed in gills but it is not believed to be the cause of disease.

A chronic liver disease was described by Animal Health Centre Pathologists in market size fish with disease resembling net pen liver disease also showed up in 4th quarter 2014. A rule out is hepatocellular hydropic degeneration which may be associated with hypoxia, as well as toxins as the antecedent.

Bacterial Kidney Disease has been a farm level diagnosis on occasion. As in other areas with high salinity, smolt in the area experience mycobacteriosis, a treatable condition, shortly after seawater entry. In early 2002 there was one case of IHN on a farm south of the current sites in Central Coast (Saksida, 2006).

The proposed facility is located in deep water with good water flow- both important environmental elements for a healthy environment for fish rearing. The facility also is also not situated in close proximity to any shellfish bed or large fish bearing streams. The local marine environment has pinnipeds and other potential predators

which can stress fish as well as cause direct mortality. Marine Harvest Canada has an SOP to limit direct interaction through the use of barriers such as nets.

In this coastal area natural plankton harmful blooms and periods of low Dissolved Oxygen (DO) are known to develop and linger for extended periods, between March and November. Most cultured salmonids are susceptible to these natural challenges, resulting in an elevated degree of health-related stress, which may result in extended periods of no feeding, increased susceptibility to other infectious disease and even death. Equipment designed to mitigate these poor water quality conditions (eg. plankton and DO tarps and upwelling compressors) can be utilized to reduce production losses during periods of high risk to fish health. Within the Health Management Plan (HMP), Marine Harvest Canada has provided a detailed Standard Operating Procedure (SOP) for phytoplankton monitoring and response. Procedures for the collection, classification and disposal of mortalities have also been provided in the event of a massive mortality episode.

Summary Recommendation For SRAR Document:

There are six farms that are operational in this central coast area, and they have been assessed as a group. The fish health status of these farms has been normal, natural and typical. It reflects only indigenous disease agents and endemic disease patterns common to all finfish of BC's marine coastal ecosystem. These are being managed effectively through the company's existing Fish Health Management plan and accompanying standard operating procedures.

It is normal for coastal areas to have natural harmful plankton blooms and periods of low dissolved oxygen, which may linger for extended periods between March and November. These natural challenges can result in an elevated degree of health-related stress leading to periods of no feeding, increased susceptibility to infectious disease or even death. Marine Harvest has submitted an appropriate plan for phytoplankton monitoring and response and the use of equipment such as tarps and upwelling water compressors to mitigate these risks to fish health.

Sea Lice: (provided by Sonja Saksida)

Published reports showed that sea lice, in particular *Lepeoptheirus salmonis* occur on the farmed fish in the area with levels varying seasonally and annually although between 2005 and 2008, levels were significantly below the 3 motile threshold (Saksida et al 2011). *Caligus clemensi* has also been reported but levels are lower and there appears to be no seasonality. For the last decade the only treatment available for the treatment of sea lice has been SLICE®. In recent years there has been evidence through bioassay and genotyping (Messmer et al 2015) of an increased tolerance to this product in the *L. salmonis* in the area, compelling an alternative treatment to be accessed by emergency release (Hydrogen Peroxide) and used to treat. This highlights the need for additional products to be made available to ensure continued efficacy through establishing an Integrated Pest Management (IPM) Program incorporating treatment rotation. This new site appears to have little hydrologic connectivity with existing farms, enabling production of two year classes with low risk of pathogen movement between year classes, another component of an effective IPM Program.

Summary Recommendation For SRAR Document:

Sea lice have been found on farms in the area with levels varying seasonally and annually. Treatments to reduce overall farm lice loads have includes the use of SLICE®, and more recently, Hydrogen Peroxide. This area needs to have multiple treatment options in order to keep sea lice under management thresholds and to follow best pest management practices which reduce risk of drug resistance developing. Goat Cove is close to Kid Bay, and this pair of farms has limited hydrologic connectivity with the existing farms, reducing pest and pathogen movement between farms and across year classes, which is another effective mitigation.

Maley, Shelley

From: Waddington, Zac
Sent: March-14-19 2:17 PM
To: Paylor, Adrienne; Patirana, Anoma
Subject: Re: sea lice paragraph for ROCs look ahead

What Adrienne said is all correct.

I am quite sure there were more than 5 sites which exceeded in 2018 in Clayoquot. Maria helped me prepare a document for C and P so you should ask her for clarification on that. Otherwise the paragraph below looks good to me.

You may want to state that all three sites which are at or approaching threshold have submitted plans which should (emphasis on should) keep them in compliance. Cermaq's purpose-built hydrolicer is projected to arrive in June or July and will be used to manage lice without reliance on drugs or pesticides.

Zac

----- Original message -----

From: "Paylor, Adrienne" <Adrienne.Paylor@dfo-mpo.gc.ca>
Date: 2019-03-14 1:40 PM (GMT-08:00)
To: "Patirana, Anoma" <Anoma.Patirana@dfo-mpo.gc.ca>
Cc: "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>
Subject: RE: sea lice paragraph for ROCs look ahead

Hi Anoma,

Not sure what deadline you have but Zac is in the field until tomorrow. I have tried to provide some information below in case you need it now but if you can wait until tomorrow for Zac that would be good. I think two farms are all over right now but that does not make them out of compliance as long as they have submitted a plan (which they did) and have 15 days to implement the plan. They are harvesting Bear bluff already and plan to do H2O2 at plover so we'll see on the 16th if they go out of compliance.

From: Patirana, Anoma
Sent: March-14-19 12:20 PM
To: Paylor, Adrienne
Cc: Waddington, Zac
Subject: sea lice paragraph for ROCs look ahead

Hey both, can you review the below paragraph? It's for a special ROCs document Andy has asked all of FM to contribute to "highlight potential issues that may arise over the next 6 months". We are limited to 6-8 sentences or 200 words MAX so it has to be fairly short). We have to summarize the issue and identify a solution. Not sure if I have characterized what is happening accurately. Please kindly edit and send back to me! Thanks in advance.

- Three Cermaq Canada marine finfish aquaculture sites in Clayoquot Sound are either at or approaching the three sea lice per fish threshold. On March 1, 2019 C&P issued a warning letter to Cermaq as a result of the exceedances from last year and to relay that the situation is being monitored closely this year. Last spring five finfish facilities owned and operated by Cermaq in the same area, experienced sea lice exceedances during the outmigration window

(March 1 to June 30th). C&P and AMD staff are working closely to ensure that clear and concise communication is occurring with Cermaq leading up to and during the 2019 out migration period. The scope of the problem is expected to be smaller in scale this year due to pre-emptive treatment of most sites with Imvixia. Cermaq has provided DFO their plan for managing the situation which they have 15 days to implement. The company is aware that DFO is closely monitoring the situation. Should the situation deteriorate AMD is in a much better position this year to coordinate with C&P to provide timely redirection to minimize risk of exposure.

Negative media coverage is anticipated if excessive sea lice exceedances occur, similar to last year.

Anoma Patirana

A/Regional Manager, Aquaculture Policy
Fisheries and Oceans Canada, Pacific Region
anoma.patirana@dfo-mpo.gc.ca / Tel: 604-666-9571

Gestionnaire régionale intérimaire, Politique de l'aquaculture
Pêches et Océans Canada, région du Pacifique
anoma.patirana@dfo-mpo.gc.ca / Tél. : 604-666-9571

s.21(1)(a)
s.21(1)(b)

s.23

Rainer, Michelle

From: Rainer, Michelle
Sent: Thursday, March 28, 2019 10:40 AM
To: Bate, Dan
Subject: RE: did you see this media release last night?

Nope, first I've seen of this. I'll contact him.
Michelle

-----Original Message-----

From: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>
Sent: March-28-19 10:38 AM
To: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Subject: FW: did you see this media release last night?

Hi Michelle - [REDACTED] emailed yesterday, did he get in touch with you on it?

Dan

-----Original Message-----

From: [REDACTED]
Sent: March-27-19 11:49 AM
To: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>
Subject: FW: did you see this media release last night?

Dan: Hoping to get a comment from DFO on this sea lice situation in Tofino.

I wrote about Slice resistance last year. Sounds like a new insecticide is being approved for treatment here?

Sounds like this particular farm, or region, may have worse problems with sea lice than others. Can you give me an update on what is being done here to address this outbreak? Is it possible the farms may have to have fish removed and fallowed?

[REDACTED]
Business in Vancouver
[REDACTED]

s.19(1)

From: [REDACTED]
Sent: Wednesday, March 27, 2019 11:41 AM
To: [REDACTED]
Subject: did you see this media release last night?

[REDACTED]
Just wanted to make sure you saw the attached media release last night?

Cheers,

Clayoquot Action

Tofino, BC

Tla-o-qui-aht First Nations territory

office 1.877.422.WILD

cell

SalmonPeople.ca<<https://salmonpeople.ca/>>

clayoquotaction.org<<http://clayoquotaction.org/>>

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instagram.com/clayoquot.action<<https://www.instagram.com/clayoquot.action/>>

s.19(1)

MEDIA LINES

Sea Lice in Clayoquot

- Seasonal and year-to-year variations in environmental parameters (eg.ocean salinity and temperature) and the number and species composition of wild salmon returns to an area are known to influence the abundance of sea lice on farms. **approved**
- In Clayoquot sound over the winter/spring of 2017-2018, the typical drop in salinity that comes with rains did not occur. This higher salinity resulted in increased lice production in the region and exacerbated the lice levels on farms. **approved**
- ~~Earlier this year~~In early 2018, Fisheries and Oceans Canada (DFO) collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed SLICE resistance. Those lice were later sent to researchers at the Atlantic Veterinary College who are undertaking work to better understand the genetic basis for SLICE resistance. **approved**
- ~~The Department also initiated a review, has reviewed which is still ongoing, of Cermaq Canada's sea lice management practices in this region and, in March 2019, issued a warning letter to Cermaq Canada Ltd. for failing to comply with its conditions of licence to determine if relevant licence conditions have been followed appropriately. In total, 7 compliance issues were found. new~~
- ~~DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the upcoming wild salmon out migration period and that its licence requirements are understood and followed. new~~
- ~~DFO has supported the development and licencing of new lice treatment methodologies and continues to work in collaboration with BC and industry to make advancements in this area to address sea lice while minimising environmental impacts and risks to wild fish. approved~~
- ~~Regarding the use and licensing of Lufenoron Please add info. Did we approve this? If not, who did? What can we say about its safety and efficacy?~~
- ~~Some examples include: the licencing for hydrogen peroxide use in BC, research into cleaner fish species, development of models to support area-based management, research into risk factors for SLICE resistance, the licencing of Imvixa (an in-feed drug used in hatchery to confer up to 9 months protection from sea louse infestation), and funding for implementation of various green technologies on sites. approved~~
- ~~In addition, since 2014, industry has made significant investments in mechanical removal technologies (hydrolicer), hosted workshops on Integrated Pest Management techniques, and purchased and ordered well boats to facilitate peroxide and fresh water bath treatments. approved~~
- Background**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**

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Created on: 28-Mar-19
Created by: Hélène Taché
Docket #:

Last saved by: Rainer, Michelle
Revised: 28-Mar-19 11:00 AM

- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**
- Salmon farming companies use an in-feed therapeutant called SLICE (emamectin benzoate) to reduce lice abundance. In British Columbia to date, SLICE has generally been a very effective tool in the management of sea lice at salmon farms. **approved**
- During most years, more than 90% of sites in BC are below the regulatory thresholds for sea lice during the wild salmon outmigration period (from March 1 to June 30 of each year). However, there were documented failures of SLICE treatment at Kiemtu in 2013 and Esperanza Inlet in 2017 and now Clayoquot Sound in 2018. **approved**
- The rotational use of hydrogen peroxide with SLICE on farms is a key component of Integrated Pest Management (IPM). IPM aims to control pests with minimal reliance on drugs/pesticides and prevent the development of resistance. **approved**
- Hydrogen peroxide is widely used on Canada's east and west coasts to remove sea lice from cultured fish. This pesticide is not absorbed by the fish and is non-toxic to humans. It also dissipates as a neutralized substance (water and oxygen) quickly in the environment, causing no discernible far-field effect. **approved**
- DFO is keeping a close eye on the issue of SLICE resistance. Research is under way, by DFO, industry, and academia, to find alternative methods to manage sea lice, and to better predict and track SLICE resistance. For instance, DFO is currently studying, or supporting research on, the use of Pacific perch as "cleaner fish" that eat sea lice off farmed fish and warm water baths to kill sea lice. More information on these projects can be found at www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm **approved**

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Created on: 28-Mar-19
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Docket #:

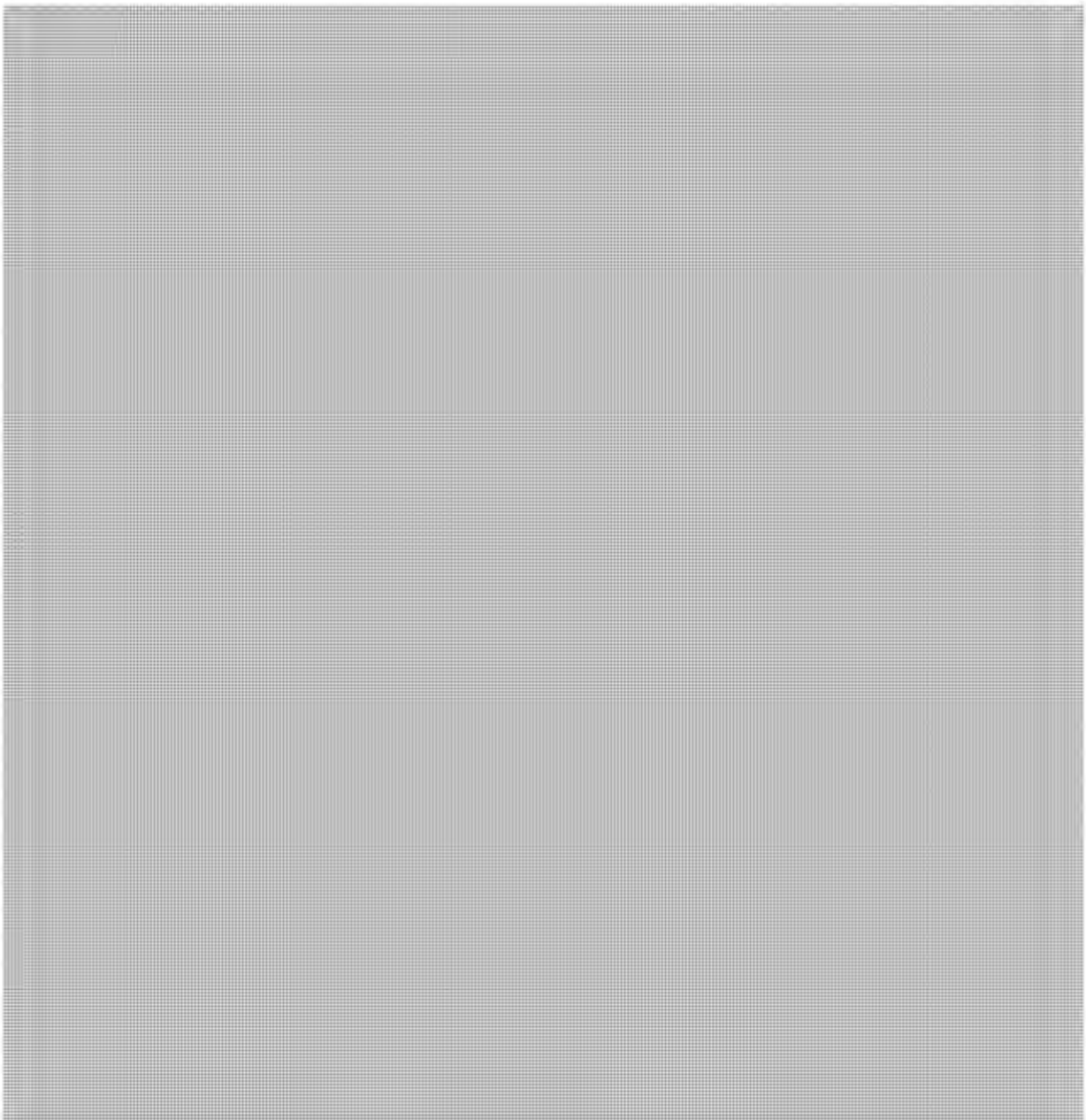
Last saved by: Rainer, Michelle
Revised: 28-Mar-19 11:00 AM



**Clayoquot
Action.org**

Box 511, Tofino BC V0R 2Z0
Phone 250-534-9453
info@clayoquotaction.org

Sea lice epidemic prompts fish farm emergency drug trial near Tofino



Page 267

**is withheld pursuant to section
est retenue en vertu de l'article**

68(a)

**of the Access to Information Act
de la Loi sur l'accès à l'information**

Rainer, Michelle

From: Rainer, Michelle
Sent: Thursday, March 28, 2019 11:06 AM
To: [REDACTED]
Subject: FW: did you see this media release last night?

[REDACTED]
I'd be happy to help with this. I admit I had not heard about Lufeneron before but am looking into it. What's your deadline?

Thanks,

Michelle Rainer

Communications Advisor | Conseillère en communications Fisheries and Oceans Canada | Pêches et Océans Canada
200 - 401 Burrard Street, Vancouver, B.C. V6C 3S4 | 200 - 401 rue Burrard, Vancouver, C.-B. V6C 3S4 Telephone |
Téléphone 604-775-5065

-----Original Message-----

From: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>
Sent: March-28-19 10:38 AM
To: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Subject: FW: did you see this media release last night?

Hi Michelle - [REDACTED] emailed yesterday, did he get in touch with you on it?

Dan

-----Original Message-----

From: [REDACTED]
Sent: March-27-19 11:49 AM
To: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>
Subject: FW: did you see this media release last night?

Dan: Hoping to get a comment from DFO on this sea lice situation in Tofino.

I wrote about Slice resistance last year. Sounds like a new insecticide is being approved for treatment here?

Sounds like this particular farm, or region, may have worse problems with sea lice than others. Can you give me an update on what is being done here to address this outbreak? Is it possible the farms may have to have fish removed and fallowed?

s.19(1)

[REDACTED]
Business in Vancouver
[REDACTED]

From: [REDACTED]
Sent: Wednesday, March 27, 2019 11:41 AM
To: [REDACTED]
Subject: did you see this media release last night?

[REDACTED]
Just wanted to make sure you saw the attached media release last night?

Cheers,

[REDACTED]
Clayoquot Action
Tofino, BC
Tla-o-qui-aht First Nations territory

office 1.877.422.WILD
cell [REDACTED]

SalmonPeople.ca<<https://salmonpeople.ca/>>

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s.19(1)

Rainer, Michelle

From: McConnachie, Sarah
Sent: Thursday, March 28, 2019 11:58 AM
To: Paylor, Adrienne
Cc: Rainer, Michelle; Waddington, Zac
Subject: Re: Lufeneron treatment in Clayoqot

Hi Adrienne - I am in the SVOP training course and we have an exam this afternoon. I will not be available to handle this today.

Sent from my iPhone

> On Mar 28, 2019, at 11:06 AM, Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca> wrote:
>
> Zac [REDACTED] and I'm on business travel (and probably don't know the info). Maybe Sarah can help?
>
> Sent from my BlackBerry 10 smartphone on the Rogers network.
> Original Message
> From: Rainer, Michelle
> Sent: Thursday, March 28, 2019 3:02 PM
> To: Waddington, Zac; Paylor, Adrienne
> Subject: Lufeneron treatment in Clayoqot
>
>
> Hi Zac and Adrienne,
> We have a media request on this and will likely receive more in the next few days. Can you please review the media release from Clayoquot Action and the proposed media lines? The lines need information on Lufeneron.
> Regards,
> Michelle
>
>
> -----Original Message-----
> From: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>
> Sent: March-28-19 10:38 AM
> To: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
> Subject: FW: did you see this media release last night?
>
> Hi Michelle - [REDACTED] emailed yesterday, did he get in touch with you on it? s.19(1)
>
> Dan
>
> -----Original Message-----
> From: [REDACTED]
> Sent: March-27-19 11:49 AM
> To: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>
> Subject: FW: did you see this media release last night?
>
> Dan: Hoping to get a comment from DFO on this sea lice situation in Tofino.
>

> I wrote about Slice resistance last year. Sounds like a new insecticide is being approved for treatment here?
>
> Sounds like this particular farm, or region, may have worse problems with sea lice than others. Can you give me an update on what is being done here to address this outbreak? Is it possible the farms may have to have fish removed and fallowed?
>
>
>
>
> [REDACTED]
> Business in Vancouver
> [REDACTED]
>
>
> _____
> From: [REDACTED]
> Sent: Wednesday, March 27, 2019 11:41 AM
> To: [REDACTED]
> Subject: did you see this media release last night?
>
> [REDACTED]
>
> Just wanted to make sure you saw the attached media release last night?
>
> Cheers,
> [REDACTED]
> Clayoquot Action
> Tofino, BC
> Tla-o-qui-aht First Nations territory
>
> office 1.877.422.WILD
> cell [REDACTED]
>
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> instagram.com/clayoquot.action<<https://www.instagram.com/clayoquot.action/>>
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s.19(1)

Maley, Shelley

From: Paylor, Adrienne
Sent: March-29-19 11:19 AM
To: McConnachie, Sarah
Cc: Waddington, Zac
Subject: Re: Lufeneron treatment in Clayoqot

Ok don't worry about we will deal with it on monday

Sent from my BlackBerry 10 smartphone on the Rogers network.

Original Message
From: McConnachie, Sarah
Sent: Friday, March 29, 2019 3:16 PM
To: Paylor, Adrienne
Cc: Waddington, Zac
Subject: Re: Lufeneron treatment in Clayoqot

I'm still in training until Saturday afternoon - seems like great timing!!

Sent from my iPhone

> On Mar 29, 2019, at 11:15 AM, Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca> wrote:

>

> I didn't hear back from anyone so if you are back in the office today

> Sarah you could check with Michelle [REDACTED]

> Cheers

> Adrienne

>

> Sent from my BlackBerry 10 smartphone on the Rogers network.

> Original Message

> From: McConnachie, Sarah

> Sent: Friday, March 29, 2019 12:29 PM

> To: Paylor, Adrienne

> Cc: Waddington, Zac

> Subject: Re: Lufeneron treatment in Clayoqot

>

>

> Hey was this dealt with? I am still in training today, but there's word we might. W done early. So I might have time this afternoon if not.

>

> Sent from my iPhone

>

>> On Mar 28, 2019, at 11:06 AM, Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca> wrote:

>> >> Zac [REDACTED] and I'm on business travel (and probably don't know the info). Maybe Sarah can help?

>>

>> Sent from my BlackBerry 10 smartphone on the Rogers network.

>> Original Message

>> From: Rainer, Michelle
>> Sent: Thursday, March 28, 2019 3:02 PM
>> To: Waddington, Zac; Paylor, Adrienne
>> Subject: Lufeneron treatment in Clayoquot

>>

>>

>> Hi Zac and Adrienne,

>> We have a media request on this and will likely receive more in the next few days. Can you please review the media release from Clayoquot Action and the proposed media lines? The lines need information on Lufeneron.

>> Regards,

>> Michelle

>>

>>

>> -----Original Message-----

>> From: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>

>> Sent: March-28-19 10:38 AM

>> To: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>

>> Subject: FW: did you see this media release last night?

>>

>> Hi Michelle - [REDACTED] emailed yesterday, did he get in touch with you on it?

>>

>> Dan

>>

>> -----Original Message-----

>> From: [REDACTED]

>> Sent: March-27-19 11:49 AM

>> To: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>

>> Subject: FW: did you see this media release last night?

>>

>> Dan: Hoping to get a comment from DFO on this sea lice situation in Tofino.

>>

>> I wrote about Slice resistance last year. Sounds like a new insecticide is being approved for treatment here?

>>

>> Sounds like this particular farm, or region, may have worse problems with sea lice than others. Can you give me an update on what is being done here to address this outbreak? Is it possible the farms may have to have fish removed and fallowed?

>>

>>

>>

>>

>> [REDACTED]

s.19(1)

>> Business in Vancouver

>> [REDACTED]

>>

>>

>> From: [REDACTED]

>> Sent: Wednesday, March 27, 2019 11:41 AM

>> To: [REDACTED]

>> Subject: did you see this media release last night?

>>

>> [REDACTED]

>>

>> Just wanted to make sure you saw the attached media release last night?
>>
>> Cheers,
>> [REDACTED]
>> Clayoquot Action
>> Tofino, BC
>> Tla-o-qui-aht First Nations territory
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>> office 1.877.422.WILD
>> cell [REDACTED]
>>
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>> instagram.com/clayoquot.action<<https://www.instagram.com/clayoquot.action>>
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s.19(1)

Maley, Shelley

From: Rainer, Michelle
Sent: April-01-19 8:36 AM
To: Waddington, Zac; McConnachie, Sarah
Cc: Paylor, Adrienne
Subject: FW: Sea Lice form letter
Attachments: Lufenuron treatment in Clayoquot

Importance: High

Follow Up Flag: FollowUp
Flag Status: Completed

Hi Zac and Sarah,

Is one of you available to help with this today? In addition the media request, there is now a petition on this issue. We will need lines ASAP.

Thanks,
Michelle

From: Anderson, Laura <Laura.Anderson@dfo-mpo.gc.ca>
Sent: March-31-19 8:19 AM
To: pac.prmc / pac.urpcm (DFO/MPO) <XPAC.PRMCU@dfo-mpo.gc.ca>
Cc: Girouard, Louise <Louise.Girouard@dfo-mpo.gc.ca>; Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Subject: Sea Lice form letter

Hello,

New-to-me letter to the Minister shared on social media through the Aqua groups; media requests may come in on the portion of the facebook post highlighted below.

<https://salmonpeople.ca/salmon-lice-epidemic-action?fbclid=IwAR3SVW-6ry4bDHPJzpyPHMnVmBeLTgRCi8lgzmMGTzySNRMmqiqXpJ1LqqO>

Breaking! Please take action today

Salmon farming giant Cermaq has a sea lice epidemic on their salmon farms in the Clayoquot Sound UNESCO Biosphere Region. They recently obtained an Emergency Drug Release to conduct the first field trial in BC of the insecticide Lufenuron. ☹️

#SilentSpringoftheSea #SalmonPeople
[Jonathan Wilkinson](#) [Justin Trudeau](#)

<https://salmonpeople.ca/salmon-lice-epidemic-action>

It's time to demand that Fisheries Minister Jonathan Wilkinson take a stand for wild salmon. He needs to stop approving toxic chemicals for use on

open-net pen salmon farms, and order a harvest of sea lice-infested farmed salmon immediately, before they can harm juvenile wild salmon currently migrating out from rivers into the ocean.

Show Minister Wilkinson that you care! Please send your letter today—feel free to personalise it to have even more impact.

Email will be sent to:

- Jonathan Wilkinson – Minister of Fisheries, Oceans, and the Canadian Coast Guard and MP for North Vancouver
- Justin Trudeau – Prime Minister of Canada and MP for Papineau
- Mel Arnold – Conservative Fisheries Critic and MP for North Okanagan—Shuswap
- Gord Johns – NDP Fisheries Critic and MP for Courtenay—Alberni
- Elizabeth May – Green Party Leader and MP for Saanich—Gulf Islands

Stop approving toxic sea lice chemicals on Clayoquot Sound salmon farms

Dear [recipient name will go here],

The Clayoquot Sound UNESCO Biosphere Region is the largest intact rainforest ecosystem left on Vancouver Island. It is not the place to field trial dangerous drugs. Despite abundant pristine habitat, salmon populations near Tofino are collapsing.

I am petitioning you to stop approving toxic chemicals for use on open-net pen salmon farms, and order a harvest of sea lice-infested farmed salmon immediately, before they can harm juvenile wild salmon currently migrating out from rivers into the ocean.

Sincerely,

[your name will go here]

[your location will go here]

Team-Lead, Digital Communications
Fisheries and Oceans Canada/Government of Canada
Laura.Anderson@dfo-mpo.gc.ca /Tel: 604-666-0392

Chef d'équipe, Communications numériques
Pêches et Océans Canada/Gouvernement du Canada
Laura.Anderson@dfo-mpo.gc.ca / Tél. 604-666-0392

Maley, Shelley

From: Rainer, Michelle
Sent: March-28-19 11:03 AM
To: Waddington, Zac; Paylor, Adrienne
Subject: Lufeneron treatment in Clayoquot
Attachments: 2019.CA.Sea Lice Lufeneron Media Release.pdf; ML_AQUA_SeaLiceClayoquot_2019.doc
Importance: High

Hi Zac and Adrienne,

We have a media request on this and will likely receive more in the next few days. Can you please review the media release from Clayoquot Action and the proposed media lines? The lines need information on Lufeneron.

Regards,

Michelle

-----Original Message-----

From: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>
Sent: March-28-19 10:38 AM
To: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Subject: FW: did you see this media release last night?

Hi Michelle - [REDACTED] emailed yesterday, did he get in touch with you on it?

Dan

-----Original Message-----

From: [REDACTED]
Sent: March-27-19 11:49 AM
To: Bate, Dan <Dan.Bate@dfo-mpo.gc.ca>
Subject: FW: did you see this media release last night?

Dan: Hoping to get a comment from DFO on this sea lice situation in Tofino.

I wrote about Slice resistance last year. Sounds like a new insecticide is being approved for treatment here?

Sounds like this particular farm, or region, may have worse problems with sea lice than others. Can you give me an update on what is being done here to address this outbreak? Is it possible the farms may have to have fish removed and fallowed?

s.19(1)

[REDACTED]
Business in Vancouver
[REDACTED]

From: [REDACTED]

Sent: Wednesday, March 27, 2019 11:41 AM

To: [REDACTED]

Subject: did you see this media release last night?

[REDACTED]

Just wanted to make sure you saw the attached media release last night?

Cheers,

[REDACTED]

Clayoquot Action

Tofino, BC

Tla-o-qui-aht First Nations territory

office 1.877.422.WILD

cell [REDACTED]

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instagram.com/clayoquot.action<<https://www.instagram.com/clayoquot.action/>>

s.19(1)

**Pages 279 to / à 280
are duplicates of
sont des duplicatas de la
page 265**

**Pages 281 to / à 282
are duplicates of
sont des duplicatas des
pages 264 to / à 265**

Maley, Shelley

From: Rainer, Michelle
Sent: April-01-19 1:22 PM
To: McConnachie, Sarah; Paylor, Adrienne; Waddington, Zac
Subject: RE: Sea Lice form letter

Thanks, Sarah, that's great.
Michelle

From: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Sent: April-01-19 1:09 PM
To: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>; Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>; Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Subject: RE: Sea Lice form letter

Michelle – See below for notes regarding your request for the following information:

- Regarding the use and licensing of Lufenuron Please add info that we approve this? If not who did? What can we say about its safety and efficacy?
- Drugs used in salmon aquaculture are approved and managed by Health Canada. The issuance of emergency drug releases (EDR) is also managed by Health Canada through the Veterinary Drugs Directorate (VDD), which works to protect human and animal health and the safety of Canada's food supply. DFO was not involved in the application or review process for the Lufenuron EDR, but we were notified by Cermaq Canada of its use in their sea lice mitigation plan. DFO supports the use of varied treatment applications to ensure that sea lice resistance to available drugs does not become a widespread problem. Varied treatment choices are consistent with a responsible integrated pest management approach to sea lice mitigation.
 - The idea is to use Lufenuron once during each production cycle, before ocean entry. Upon ocean entry, the fish should be protected from sea lice infestation for up to 6-9 months, after which other treatment modalities can be utilized once the effectiveness period is over. This will reduce the reliance on emamectin benzoate (SLICE®), hydrogen peroxide use, and other stressful treatment modalities.
- Lufenuron is used widely and safely in veterinary medicine as a topical flea/parasite preventative for dogs and cats. It is also widely used in agriculture as an anti-fungal agent on crops such as grapes and potatoes. Lufenuron has recently been developed as a new in-feed treatment for sea lice. It has been widely used under the trade name Imvixa™ in Chile, and is under consideration for use in North America and Europe. In Chile, Imvixa is administered to the fish in their food while they are being reared in freshwater facilities so it does not enter the environment directly during treatment. Following treatment, the fish are held for at least 7 additional days to allow excretion of unabsorbed, active pharmaceutical before they are transferred to marine sites. This same procedure was followed by Cermaq Canada. Field use in Chile has shown that the treatment has been highly effective for up to 8 months following seawater transfer.
 - Lufenuron is absorbed into the fat of an animal and is transferred into tissues that are consumed by parasitizing sea lice. The drug effectively inhibits chitin synthesis within 24-48 hours of exposure, which inhibits lice moulting to different life stages, and also reduces egg viability.

- Regarding the risk that the use of this product may pose to other animals that produce chitin (i.e., crustaceans), it is only for use in freshwater facilities as part of its conditions of use and should therefore not be released into the environment
- Resistance issues have not been described for Lufenuron use in small animals, and is rarely described in agricultural-use. It's efficacy is also reported to be much higher than other sea lice treatment options.
- Tissue residues are not detected 3 months following treatment, and since fish are grown at sea for up to 22 months following treatment, it is considered unlikely that residues will have any relevant impact on the receiving environment.

Sources:

- McHenry JG. 2016. Lufenuron for salmonids: Environmental assessment in support of an import tolerance request (USA). Accessed: <https://www.fda.gov/downloads/AnimalVeterinary/Products/ImportExports/UCM521844.pdf>
- Poley JD et al., 2018. High level efficacy of lufenuron against sea lice (*Lepeophtheirus salmonis*) linked to rapid impact on moulting processes. International Journal for Parasitology: Drugs and Drug Resistance, 8(2):174-188.

Let me know if I can provide any further information,

Dr. Sarah McConnachie MSc, PhD, DVM

Field Operations Veterinarian - Pacific Region
 Fisheries and Oceans Canada | Pêches et Océans Canada
 Aquaculture Environmental Operations - Fish Health
 Courtenay, British Columbia
 Telephone | Téléphone: 250-703-0929
 Cell Phone | Téléphone Portable: [REDACTED]
 Fax | Télécopieur: 250-703-0921
Sarah.McConnachie@dfo-mpo.gc.ca



Government
of Canada

Gouvernement
du Canada

Canada

From: Rainer, Michelle
Sent: April-01-19 11:09 AM
To: Paylor, Adrienne; McConnachie, Sarah; Waddington, Zac
Subject: RE: Sea Lice form letter

Hi Adrienne,
 Sarah is providing info for the lines so I think we're good. I'll send on to you once we have a draft.
 Thanks,
 Michelle

From: Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>
Sent: April-01-19 11:05 AM
To: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>; Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>;
 Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Subject: Re: Sea Lice form letter

Is Howie back? Maybe he can help?

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: McConnachie, Sarah

s.16(2)(c)

Sent: Monday, April 1, 2019 1:47 PM
To: Rainer, Michelle; Waddington, Zac
Cc: Paylor, Adrienne
Subject: RE: Sea Lice form letter

Hi Michelle,

Zac is currently in-transit to Ottawa so is unavailable to immediately comment. I've never provided media lines (started 6 mo ago), so let me know if there is a specific formula to follow.

Maybe we could chat on the phone if that's easier – call me at 250-703-0929

Sarah

From: Rainer, Michelle
Sent: April-01-19 8:36 AM
To: Waddington, Zac; McConnachie, Sarah
Cc: Paylor, Adrienne
Subject: FW: Sea Lice form letter
Importance: High

Hi Zac and Sarah,

Is one of you available to help with this today? In addition the media request, there is now a petition on this issue. We will need lines ASAP.

Thanks,
Michelle

From: Anderson, Laura <Laura.Anderson@dfo-mpo.gc.ca>
Sent: March-31-19 8:19 AM
To: pac.prmc / pac.urpcm (DFO/MPO) <XPAC.PRMCU@dfo-mpo.gc.ca>
Cc: Girouard, Louise <Louise.Girouard@dfo-mpo.gc.ca>; Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Subject: Sea Lice form letter

Hello,

New-to-me letter to the Minister shared on social media through the Aqua groups; media requests may come in on the portion of the facebook post highlighted below.

<https://salmonpeople.ca/salmon-lice-epidemic-action?fbclid=IwAR3SVW-6ry4bDHPJzpyPHMnVmBeLTgRCi8lgzmMGTzySNRMnqiqXpJ1Lqq0>

Breaking! Please take action today

Salmon farming giant Cermaq has a sea lice epidemic on their salmon farms in the Clayoquot Sound UNESCO Biosphere Region. They recently obtained an Emergency Drug Release to conduct the first field trial in BC of the insecticide Lufenuron. 🐟🐟

#SilentSpringoftheSea #SalmonPeople
[Jonathan Wilkinson](#) [Justin Trudeau](#)

<https://salmonpeople.ca/salmon-lice-epidemic-action>

It's time to demand that Fisheries Minister Jonathan Wilkinson take a stand for wild salmon. **He needs to to stop approving toxic chemicals for use on open-net pen salmon farms**, and order a harvest of sea lice-infested farmed salmon immediately, before they can harm juvenile wild salmon currently migrating out from rivers into the ocean.

Show Minister Wilkinson that you care! Please send your letter today—feel free to personalise it to have even more impact.

Email will be sent to:

- Jonathan Wilkinson – Minister of Fisheries, Oceans, and the Canadian Coast Guard and MP for North Vancouver
- Justin Trudeau – Prime Minister of Canada and MP for Papineau
- Mel Arnold – Conservative Fisheries Critic and MP for North Okanagan—Shuswap
- Gord Johns – NDP Fisheries Critic and MP for Courtenay—Alberni
- Elizabeth May – Green Party Leader and MP for Saanich—Gulf Islands

Stop approving toxic sea lice chemicals on Clayoquot Sound salmon farms

Dear [recipient name will go here],

The Clayoquot Sound UNESCO Biosphere Region is the largest intact rainforest ecosystem left on Vancouver Island. It is not the place to field trial dangerous drugs. Despite abundant pristine habitat, salmon populations near Tofino are collapsing.

I am petitioning you to stop approving toxic chemicals for use on open-net pen salmon farms, and order a harvest of sea lice-infested farmed salmon immediately, before they can harm juvenile wild salmon currently migrating out from rivers into the ocean.

Sincerely,

[your name will go here]

[your location will go here]

Team-Lead, Digital Communications
Fisheries and Oceans Canada/Government of Canada
Laura.Anderson@dfo-mpo.gc.ca /Tel: 604-666-0392

Chef d'équipe, Communications numériques
Pêches et Océans Canada/Gouvernement du Canada
Laura.Anderson@dfo-mpo.gc.ca / Tél. 604-666-0392

Rainer, Michelle

From: Rainer, Michelle
Sent: Monday, April 1, 2019 1:45 PM
To: McConnachie, Sarah; Doucette, Claire
Subject: Media lines for approval
Attachments: ML_AQUA_SeaLiceClayoquot_2019.doc

Hi Sarah,

For your review and approval. Please change as needed using track changes.

Claire, can you please review and approve the responsive section on the results of the investigation?

Thanks,
Michelle

MEDIA LINES

Sea Lice in Clayoquot

- The abundance of sea lice on marine salmon farms is influenced by seasonal and year-to-year variations in ocean salinity and temperature, as well as the number and species of wild salmon returning to an area. **Approved**
- In Clayoquot sound over the winter/spring of 2017-2018, the typical drop in salinity that comes with rains did not occur. This higher salinity resulted in increased lice production in the region and exacerbated the lice levels on farms. **Approved**
- yearin early 2018, Fisheries and Oceans Canada (DFO) collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed emamectin benzoate (SLICE®) resistance. **Approved**
- Due to continuing high ocean salinity in 2019, there is concern that sea lice levels may once again be high during the critical juvenile outmigration period this spring. DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the upcoming wild salmon out migration period and that its licence requirements are understood and followed. **New**
- Health Canada has issued an emergency drug release (EDR) to Cermaq Canada for the use of Lufenuron. Drugs used in salmon aquaculture are approved and managed by Health Canada.
- DFO was not involved in the application or review process for the Lufenuron EDR but we were notified by Cermaq Canada of its use in their sea lice mitigation plan. DFO supports the use of varied treatment applications to ensure that sea lice resistance to available drugs does not become a widespread problem. Varied treatment choices are consistent with a responsible integrated pest management approach to sea lice mitigation.
- Lufenuron is used widely and safely in veterinary medicine as a topical flea/parasite preventative for dogs and cats.
- When used to treat salmon, it is not administered in the ocean environment. Rather, fish are treated in land-based facilities prior to transfer to marine sites.
- Upon ocean entry, the fish should be protected from sea lice infestation for up to 6 to 9 months, thus reducing reliance on and other treatments that may be stressful to fish.
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**

Commented [RM1]: Just guessing about this; please confirm or change as needed.

Responsive on results of investigation

- The Department has reviewed Cermaq Canada's sea lice management practices in this region and, in March 2019, issued a warning letter to Cermaq Canada Ltd. for failing to comply with its conditions of licence. In total, 7 compliance issues were found. **new**

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Created on: 28-Mar-19
Created by: Hélène Taché
Docket #:

Last saved by: Rainer, Michelle
Revised: 1-Apr-19 1:43 PM

- DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the upcoming wild salmon out migration period and that its licence requirements are understood and followed. **new**

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Created by: H       Tach  
Docket #:

Last saved by: Rainer, Michelle
Revised: 1-Apr-19 1:43 PM

Maley, Shelley

From: Paylor, Adrienne
Sent: April-01-19 3:32 PM
To: Waddington, Zac
Subject: Fw: Media lines for approval
Attachments: ML_AQUA_SeaLiceClayoquot_2019.doc

FYI I approved these with the comments I sent in the other email. If anything needs to be corrected further let us know. Thx A

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>
Sent: Monday, April 1, 2019 5:48 PM
To: Paylor, Adrienne
Subject: Media lines for approval

Hi Adrienne,

Sarah has approved these. Ready for your review—I've also sent these to Clare Doucette for review of the C&P portion.

Thanks,
Michelle

MEDIA LINES

Sea Lice in Clayoquot

- The abundance of sea lice on marine salmon farms is influenced by seasonal and year-to-year variations in ocean salinity and temperature, as well as the number and species of wild salmon returning to an area. **Approved**
- In Clayoquot sound over the winter/spring of 2017-2018, the typical drop in salinity that comes with rains did not occur. This higher salinity resulted in increased lice production in the region and exacerbated the lice levels on farms. **Approved**
- In early 2018, Fisheries and Oceans Canada (DFO) collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed emamectin benzoate (SLICE®) resistance. **Approved**
- Due to continuing high ocean salinity in 2019, there is concern that sea lice levels may once again be high during the critical juvenile outmigration period this spring. DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the outmigration period and that its licence requirements are understood and followed. **New**
- Health Canada has issued an emergency drug release (EDR) to Cermaq Canada for the use of Lufenuron. Drugs used in salmon aquaculture are approved and managed by Health Canada. **new**
- DFO was not involved in the application or review process for the Lufenuron EDR but we were notified by Cermaq Canada of its use in their sea lice mitigation plan. DFO supports the use of varied treatment applications to ensure that sea lice resistance to available drugs does not become a widespread problem. Varied treatment choices are consistent with a responsible integrated pest management approach to sea lice mitigation. **new**
- Lufenuron is used widely and safely in veterinary medicine as a topical flea/parasite preventative for dogs and cats. **new**
- When used to treat salmon, it is not administered in the ocean environment. Rather, fish are treated in land-based, freshwater facilities prior to transfer to marine sites. **new**
- Upon ocean entry, the fish should be protected from sea lice infestation for up to 6 to 9 months, thus reducing reliance on and other treatments that may be stressful to fish. **new**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**

Responsive on results of investigation

- The Department has reviewed Cermaq Canada's sea lice management practices in this region and, in March 2019, issued a warning letter to Cermaq Canada Ltd. for failing to comply with its conditions of licence. In total, 7 compliance issues were found. **new**

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Created on: 1-Apr-19
Created by: Hélène Taché
Docket #:

Last saved by: Rainer, Michelle
Revised: 1-Apr-19 2:47 PM

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Rainer, Michelle

From: Rainer, Michelle
Sent: Monday, April 1, 2019 4:10 PM
To: Bate, Dan (Dan.Bate@dfo-mpo.gc.ca)
Subject: FW: For approval: Lufenuron / Sea lice in Clayoquot
Attachments: 2019.CA.Sea Lice Lufenuron Media Release.pdf

Hi Dan,

[REDACTED] but still working on this one. It's with Allison now. I wrote it up as [REDACTED] inquiry but he didn't respond so not sure if he's still interested; we'll need the lines in any case so no harm in sending them to him once approved.

From: Rainer, Michelle
Sent: April-01-19 3:47 PM
To: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>
Subject: For approval: Lufenuron / Sea lice in Clayoquot

Issue: [REDACTED] Business in Vancouver [REDACTED] Looking for information on Cermaq Canada's use of Lufenuron to treat sea lice. Clayoquot Action has issued a press release (attached) and a group called Salmon People has started a letter writing campaign. There have been concerns about sea lice levels in Clayoquot Sound over the past year and last year Cermaq's farms in the area had high lice levels during the wild salmon outmigration period.

Deadline: April 2, noon PST

Recommendation: email response

Approved by: Sarah McConnachie, Claire Doucette, Adrienne Paylor

- The abundance of sea lice on marine salmon farms is influenced by seasonal and year-to-year variations in ocean salinity and temperature, as well as the number and species of wild salmon returning to an area. **Approved**
- In Clayoquot sound over the winter/spring of 2017-2018, the typical drop in salinity that comes with rains did not occur. This higher salinity resulted in increased lice production in the region and exacerbated the lice levels on farms. **Approved**
- In early 2018, Fisheries and Oceans Canada (DFO) collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed emamectin benzoate (SLICE®) resistance. **Approved**
- Due to continuing high ocean salinity in 2019, there is concern that sea lice levels may once again be high during the critical juvenile outmigration period this spring. DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the outmigration period and that its licence requirements are understood and followed. **New**
- Health Canada has issued an emergency drug release (EDR) to Cermaq Canada for the use of Lufenuron. Drugs used in salmon aquaculture are approved and managed by Health Canada. **new**
- Lufenuron is used widely and safely in veterinary medicine as a topical flea/parasite preventative for dogs and cats. **new**
- When used to treat salmon, it is not administered in the ocean environment. Rather, fish are treated in land-based, freshwater facilities prior to transfer to marine sites. **New**

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- DFO was not involved in the application or review process for the Lufenuron EDR but we were notified by Cermaq Canada of its use in their sea lice mitigation plan. DFO supports the use of varied treatment applications to ensure that sea lice resistance to available drugs does not become a widespread problem. Varied treatment choices are consistent with a responsible, integrated pest management approach to sea lice mitigation. **new**
- Upon ocean entry, the fish should be protected from sea lice infestation for up to 6 to 9 months, thus reducing reliance on and other treatments that may be stressful to fish. **new**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**

Responsive on results of investigation

- The Department has reviewed Cermaq Canada's sea lice management practices in this region and, in March 2019, issued a warning letter to Cermaq Canada Ltd. for violation of certain conditions of licence. In total, 7 compliance issues were found. **new**
- DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the upcoming wild salmon out migration period and that its licence requirements are understood and followed. **new**

**Pages 295 to / à 296
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page 265**

Maley, Shelley

From: Webb, Allison
Sent: April-01-19 7:12 PM
To: Rainer, Michelle
Subject: Re: For approval: Lufenuron / Sea lice in Clayoquot

Would be good to add in the bullet re the par, some reference to managing lice to minimize risk to wild salmon smolts out migrating - that is why we have these thresholds and why the companies need to treat. The link btw wild salmon protection and Aqua Management could be better explained upfront. Otherwise looks good albeit long.

Thanks,
Allison

Sent from my BlackBerry 10 smartphone on the Bell network.

From: Rainer, Michelle
Sent: Monday, April 1, 2019 6:46 PM
To: Webb, Allison
Subject: For approval: Lufenuron / Sea lice in Clayoquot

Issue: [REDACTED] Business in Vancouver [REDACTED] Looking for information on Cermaq Canada's use of Lufenuron to treat sea lice. Clayoquot Action has issued a press release (attached) and a group called Salmon People has started a [letter writing campaign](#). There have been concerns about sea lice levels in Clayoquot Sound over the past year and last year Cermaq's farms in the area had high lice levels during the wild salmon outmigration period.

Deadline: April 2, noon PST

Recommendation: email response

Approved by: Sarah McConnachie, Claire Doucette, Adrienne Paylor

- The abundance of sea lice on marine salmon farms is influenced by seasonal and year-to-year variations in ocean salinity and temperature, as well as the number and species of wild salmon returning to an area. **Approved**
- In Clayoquot sound over the winter/spring of 2017-2018, the typical drop in salinity that comes with rains did not occur. This higher salinity resulted in increased lice production in the region and exacerbated the lice levels on farms. **Approved**
- In early 2018, Fisheries and Oceans Canada (DFO) collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed emamectin benzoate (SLICE®) resistance. **Approved**
- Due to continuing high ocean salinity in 2019, there is concern that sea lice levels may once again be high during the critical juvenile outmigration period this spring. DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the outmigration period and that its licence requirements are understood and followed. **New**
- Health Canada has issued an emergency drug release (EDR) to Cermaq Canada for the use of Lufenuron. Drugs used in salmon aquaculture are approved and managed by Health Canada. **new**
- Lufenuron is used widely and safely in veterinary medicine as a topical flea/parasite preventative for dogs and cats. **new**

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- When used to treat salmon, it is not administered in the ocean environment. Rather, fish are treated in land-based, freshwater facilities prior to transfer to marine sites. **New**
- DFO was not involved in the application or review process for the Lufenuron EDR but we were notified by Cermaq Canada of its use in their sea lice mitigation plan. DFO supports the use of varied treatment applications to ensure that sea lice resistance to available drugs does not become a widespread problem. Varied treatment choices are consistent with a responsible integrated pest management approach to sea lice mitigation. **new**
- Upon ocean entry, the fish should be protected from sea lice infestation for up to 6 to 9 months, thus reducing reliance on and other treatments that may be stressful to fish. **new**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**

Responsive on results of investigation

- The Department has reviewed Cermaq Canada's sea lice management practices in this region and, in March 2019, issued a warning letter to Cermaq Canada Ltd. for violation of certain conditions of licence. In total, 7 compliance issues were found. **new**
- DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the upcoming wild salmon out migration period and that its licence requirements are understood and followed. **new**

Maley, Shelley

From: McCorquodale, Brenda
Sent: April-02-19 2:10 PM
To: Shaw, Kerra; Waddington, Zac; Paylor, Adrienne
Subject: Proposed response to ENGOs
Attachments: CRWG draft Mar2019.doc

Hi all

Please find attached a proposed draft response to the ENGO letter.

Zac I added a lot to make your section flow a bit more, and Kerra we just broke yours up a bit into the sections as outlined in the incoming letter. I did add one sentence you might want to check out: If the thresholds are exceeded, a mandatory fallowing period is implemented. The rest of the edits were mostly just for consistency.

If possible can you guys please take a look through this as soon as possible to see if it is good. We hope to get it out to the ENGOs before the meeting.

Thank you!

Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des peches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865



Fisheries and Oceans
Canada

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Nanaimo, BC
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Pêches et Océans
Canada

Région du Pacifique
1965 Island Diesel Way
Nanaimo (C.-B.)
V9S 5W8

April 3, 2019

Ms. Karen Wristen, Executive Director
Living Oceans Society
1407-207 Hastings St W,
Vancouver BC V6B 1H7

Dear Ms. Wristen,

RE: MARINE FINFISH AQUACULTURE MANAGEMENT CONCERNS

Thank you for your letter of February 12, 2019 written on behalf of the Conservation Regulatory Working Group. Your input is appreciated, and we are glad to be able to have the opportunity both to respond to these concerns and to meet next week in person to continue this dialogue.

Sea lice management

As you have highlighted, sea lice management and sea lice resistance are significant issues and are important priorities for Fisheries and Oceans Canada (the Department). Monitoring sea lice levels and preventing the development of sea lice resistance or adaptation to treatments is a marine finfish aquaculture management and science priority. Are you aware the Department conducts both sea lice audits on marine finfish farms and undertakes research into sea lice levels on wild fish.

We continue to explore and adopt improved ways of managing aquaculture. For example, on December 18, 2018 the Minister of Fisheries and Oceans Canada announced a renewed approach to aquaculture management, including moving towards an area-based approach to aquaculture management (<https://www.canada.ca/en/fisheries-oceans/news/2018/12/government-of-canada-announces-new-way-forward-on-aquaculture-management-and-the-protection-of-wild-salmon.html>). This new approach will facilitate new approaches which could include a move toward managing aggregate levels of sea lice on farms or within areas that may have hydrological connectivity.

The Department is also taking an area-specific management approach to sea lice in some areas with abundant sea lice. As a part of planning with industry to reduce sea lice abundance and resistance in Clayoquot Sound, all smolts since the 2018 outmigration

Canada

have been treated with the drug Imvixa in the hatchery. This drug confers 6-9 months of sea lice resistance to treated fish. For the three remaining sites, sea lice management plans include approaches to facilitate either harvest and/or peroxide treatments in order to remain below the federal marine finfish aquaculture sea lice threshold requirements.

We are not aware of any interest from industry to apply to use Azamethiphos for treatment of gill disease in BC. Should they apply to use this treatment, we would be consulted through the Emergency Drug Release process. As you state, this process takes many months, and would not likely occur for the 2019 salmon outmigration. However, we appreciate hearing about the possibility that treatments with Azamethiphos may counter-indicate the use of hydrogen peroxide baths, and will explore this further.

SLICE resistant sea lice have now been found in several marine finfish aquaculture areas, however they do not appear to be spreading from one geographic area to another. The current evidence is that the small sub-population of lice with a naturally occurring resistance to SLICE is selected for and becomes dominant in a farm or farming area when SLICE is used repeatedly. Through the use of Imvixa, and in the future through additional management and planning, the Department believes that replenishment of the population with non-resistant lice, and with a management regime that utilizes multiple treatments and approaches, should allow areas to return to non-resistant populations where SLICE could be used effectively as one sea lice management tool (“it could be hypothesized that dilution by large numbers of naïve lice from returning hosts could inhibit the establishment and spread of any such advantageous mutation should it emerge in the Pacific.” (Besnier et al., 2014; Jacobsen et al., 2012)).

Licensed biomass

As noted in your letter, Marine finfish aquaculture licences do indicate a maximum peak biomass. Although the provincial government used to licence total production taken off the farm, Fisheries and Oceans Canada does not licence in this manner. We licence peak biomass, which is the maximum amount of standing tonnage on a farm during a production cycle, because this is the time of greatest environmental impact. The Department and industry interpret this in the same way; sites are “allowed” to harvest more off of the farm than is on the face of their licence, as long as they do not exceed their peak biomass at any time during a production cycle. DFO has licenced and defined tonnage in this same way when Section 35(2) Authorizations were issued under the *Fisheries Act* from 2003-2010, and then through licence conditions from 2010 onward.

As you have noted, there is an increasing trend of adding cages to arrays without tonnage increases. This occurs because decreasing fish stocking and growing densities and adding more ability for water flow has been demonstrated to increase fish health and growth rates. It also decreases the intensity of organic loading on the seabed, which helps with remediation times. This approach is beneficial for both aquaculturists and the environment, and is supported by the Department.

Modeling and site selection

In your letter, you ask if farms are required to conduct additional modeling to estimate the impacts of the additional biomass over the period of a single grow-out cycle, as they are exceeding licensed biomass during a production cycle.

As previously stated, since initiating the use of DEPOMOD in BC, the metric of peak biomass has always been used as an input, which aligns with how DFO licences tonnage, and we have never used the metric of total production taken off a site. We enter the greatest standing tonnage expected (the peak biomass) which aligns with greatest feed rates to predict the worst case scenario impact on the seabed. This continues to be used in siting decisions to understand where and how impacts are expected to occur. The Department acknowledges that sites can harvest more tonnage from a farm than the tonnage on the face of their licence, and we do not interpret this to be an exceedance or a violation of the licence, as it is a different metric than what is licenced. We have had this management approach since 2003, and as this model already uses peak biomass, we do not use additional modelling required to understand how impact occurs. Monitoring over time has continued to demonstrate that peak biomass is a more relevant predictor of benthic impact than total production harvested.

Peak Biomass Monitoring

You asked about the timing of the sampling for peak biomass at marine finfish aquaculture sites. The Department recognizes that peak biomass is sustained for weeks to months, rather than a single moment in time. In recent years, companies have been harvesting over a longer time than formerly, partly because companies no longer regularly "grade" fish during production cycles to avoid unnecessary handling. Instead, they harvest the biggest fish from each pen, leaving the smaller fish to grow for a few months. Additionally, this can allow a company to provide fish to markets 365 days a year because harvests are occurring almost constantly at least one at of their farms. And finally, with very few new sites being added in recent years, companies are trying to optimize the amount of fish they can harvest from sites while still meeting environmental thresholds, such as sea lice and benthic impacts.

Although peak biomass can be prolonged, there is always a single day that is the actual peak. As has been the case since 2002, licence holders must monitor the sea bed within 30 days either side of that date. If they monitor once around that date but hold fish long enough that a second larger peak is reached, they must monitor again to be in compliance with the Aquaculture Activities Regulations. Over time, we have not seen benthic impacts increasing; we have actually seen them decreasing. This is due to many factors such as new feeds with better digestibility and food conversion rates, more monitoring to reduce waste of feed, moving sites deeper offshore, and adding extra cages (as above) without adding more tonnage. This allows waste impacts to be less intense on the seabed, which allows faster remediation. We see 80-90% of sites stocking production cycle after

production cycle while still staying under set environmental thresholds, which aligns with our sustainability objectives. If the thresholds are exceeded, a mandatory fallowing period is implemented. Monitoring over time has continued to demonstrate that peak biomass is a more relevant predictor of benthic impact than total production harvested.

We continue to licence peak biomass and have industry monitor within 30 days of that window. Additionally, DFO staff field audit benthic performance at >20% of active farms every year. Our data aligns very well with industry results, and we post this information on our website. Total harvested production has often exceeded peak biomass production over the time DFO has been using this metric for management, so there is no extra regulation being considered to manage it now. Benthic health is always a priority for the Department, and sites have been continuing to improve their performance over time. At this time, water quality is not being measured because research conducted in the early 2000s indicated that impacts could not be detected very far from cage edges. However, some new work is being conducted through a national DFO initiative called the Aquaculture Monitoring Program and water quality testing will likely be initiated this year to look at determine if this is still correct. We would be happy to provide you with additional information if you are interested.

PRV and the Federal Court decision

The Department is in the process of developing its response to the Federal Court decision and the most recent science work related to *piscine reovirus*. We would be pleased to speak to you about this approach in a future meeting.

We look forward to meeting you on Monday, April 8 to discuss these matters further.

Sincerely,

Brenda McCorquodale
Manager, Aquaculture Management Division
Fisheries and Oceans Canada

Maley, Shelley

From: McCorquodale, Brenda
Sent: April-02-19 2:51 PM
To: Shaw, Kerra; Waddington, Zac; Paylor, Adrienne
Cc: Webb, Allison
Subject: RE: Proposed response to ENGOS
Attachments: CRWG draft Mar2019 2.doc

Follow Up Flag: Follow up
Flag Status: Completed

Thanks Kerra for the input. Here is the updated version. [REDACTED]

[REDACTED] and see if it looks good to go? ;) Thanks! [REDACTED]

Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des pêches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-902-8865

From: McCorquodale, Brenda
Sent: Tuesday, April 02, 2019 2:10 PM
To: Shaw, Kerra; Waddington, Zac; Paylor, Adrienne
Subject: Proposed response to ENGOS

Hi all

Please find attached a proposed draft response to the ENGO letter.

Zac I added a lot to make your section flow a bit more, and Kerra we just broke yours up a bit into the sections as outlined in the incoming letter. I did add one sentence you might want to check out: If the thresholds are exceeded, a mandatory fallowing period is implemented. The rest of the edits were mostly just for consistency.

If possible can you guys please take a look through this as soon as possible to see if it is good. We hope to get it out to the ENGOS before the meeting.

Thank you!

Brenda

Brenda McCorquodale

s.19(1)

Regional Manager, Aquaculture Resource Management

Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des pêches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8

Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca

Telephone | Téléphone: 250-902-8865

No information has been removed or severed from this page



Fisheries and Oceans
Canada

Pacific Region
1965 Island Diesel Way
Nanaimo, BC
V9S 5W8

Pêches et Océans
Canada

Région du Pacifique
1965 Island Diesel Way
Nanaimo (C.-B.)
V9S 5W8

April 3, 2019

Ms. Karen Wristen, Executive Director
Living Oceans Society
1407-207 Hastings St W,
Vancouver BC V6B 1H7

Dear Ms. Wristen,

RE: MARINE FINFISH AQUACULTURE MANAGEMENT CONCERNS

Thank you for your letter of February 12, 2019 written on behalf of the Conservation Regulatory Working Group. Your input is appreciated, and we are glad to be able to have the opportunity both to respond to these concerns and to meet next week in person to continue this dialogue.

Sea lice management

As you have highlighted, sea lice management and sea lice resistance are significant issues and are important priorities for Fisheries and Oceans Canada (the Department). Monitoring sea lice levels and preventing the development of sea lice resistance or adaptation to treatments is a marine finfish aquaculture management and science priority. Are you are aware the Department conducts both sea lice audits on marine finfish farms and undertakes research into sea lice levels on wild fish.

We continue to explore and adopt improved ways of managing aquaculture. For example, on December 18, 2018 the Minister of Fisheries and Oceans Canada announced a renewed approach to aquaculture management, including moving towards an area-based approach to aquaculture management (<https://www.canada.ca/en/fisheries-oceans/news/2018/12/government-of-canada-announces-new-way-forward-on-aquaculture-management-and-the-protection-of-wild-salmon.html>). Area based aquaculture management will facilitate new approaches which could include a move toward managing aggregate levels of sea lice on farms or within areas that may have hydrological connectivity.

The Department is also taking an area-specific management approach to sea lice in some areas with abundant sea lice. As a part of planning with industry to reduce sea lice

Canada

abundance and resistance in Clayoquot Sound, all smolts since the 2018 outmigration have been treated with the drug Imvixa in the hatchery. This drug confers 6-9 months of sea lice resistance to treated fish. For the three remaining sites, sea lice management plans include approaches to facilitate either harvest and/or peroxide treatments in order to remain below the federal marine finfish aquaculture sea lice threshold requirements.

We are not aware of any interest from industry to apply to use Azamethiphos for treatment of gill disease in BC. Should they apply to use this treatment, we would be consulted through the Emergency Drug Release process. As you state, this process takes many months, and would not likely occur for the 2019 salmon outmigration. However, we appreciate hearing about the possibility that treatments with Azamethiphos may counter-indicate the use of hydrogen peroxide baths, and will explore this further.

SLICE resistant sea lice have now been found in several marine finfish aquaculture areas, however they do not appear to be spreading from one geographic area to another. The current evidence is that the small sub-population of lice with a naturally occurring resistance to SLICE is selected for and becomes dominant in a farm or farming area when SLICE is used repeatedly. Through the use of Imvixa, and in the future through additional management and planning, the Department believes that replenishment of the population with non-resistant lice, and with a management regime that utilizes multiple treatments and approaches, should allow areas to return to non-resistant populations where SLICE could be used effectively as one sea lice management tool (“it could be hypothesized that dilution by large numbers of naïve lice from returning hosts could inhibit the establishment and spread of any such advantageous mutation should it emerge in the Pacific.” (Besnier et al., 2014; Jacobsen et al., 2012)).

Licensed biomass

As noted in your letter, marine finfish aquaculture licences do indicate a maximum peak biomass. Although the provincial government used to licence total production harvested off the farm, the Department does not licence in this manner. We licence peak biomass, which is the maximum amount of standing tonnage on a farm during a production cycle, because this is the time of greatest environmental impact. The Department and industry interpret this in the same way; sites are “allowed” to harvest more off of the farm than is on the face of their licence, as long as they do not exceed their peak biomass at any time during a production cycle. We have licenced and defined tonnage in this same way when Section 35(2) Authorizations were issued under the *Fisheries Act* from 2003-2010, and then through licence conditions from 2010 onward.

As you have noted, there is an increasing trend of adding cages to arrays without tonnage increases. This occurs because decreasing fish stocking/growing densities and adding more ability for water flow has been demonstrated to increase fish health and growth rates. It also decreases the intensity of organic loading on the seabed, which helps with

remediation times. This approach is beneficial for both aquaculturists and the environment, and is supported by the Department.

Modeling and site selection

In your letter, you ask if farms are required to conduct additional modeling to estimate the impacts of the additional biomass over the period of a single grow-out cycle.

As previously stated, since initiating the use of DEPOMOD in BC, the metric of peak biomass has always been used as an input, which aligns with how we licence tonnage, and we have never used the metric of total production taken off a site. We enter the greatest standing tonnage expected (the peak biomass) along with the greatest feed rates to predict the worst case scenario impact on the seabed. This continues to be used in siting decisions to understand where and how impacts are expected to occur, along with where operational monitoring should occur. The Department acknowledges that sites can harvest more tonnage from a farm than the tonnage on the face of their licence, and we do not interpret this to be an exceedance or a violation of the licence, as it is a different metric than what is licenced. We have had this management approach since 2003, and as this model already uses peak biomass, we do not use additional modelling required to understand how impact occurs. Monitoring over time has continued to demonstrate that peak biomass is a more relevant predictor of benthic impact than total production harvested.

Peak Biomass Monitoring

You asked about the timing of the sampling for peak biomass at marine finfish aquaculture sites. The Department recognizes that peak biomass is sustained for weeks to months, rather than a single moment in time. In recent years, companies have been harvesting over a longer time than formerly, partly because companies no longer regularly “grade” fish during production cycles to avoid unnecessary handling. Instead, they harvest the biggest fish from each pen, leaving the smaller fish to grow for a few months. Additionally, this can allow a company to provide fish to markets 365 days a year because harvests are occurring almost constantly at least one at of their farms. And finally, with very few new sites being added in recent years, companies are trying to optimize the amount of fish they can harvest from sites while still meeting environmental thresholds, such as sea lice and benthic impacts.

Although peak biomass can be prolonged, there is always a single day that is predicted to be the actual peak due to feed inputs and biomass estimates. As has been the case since 2002, licence holders must monitor the sea bed within 30 days either side of that date. If they monitor once around that date but hold fish long enough that a second larger peak is reached, they must monitor again to be in compliance with the *Aquaculture Activities Regulations*. Over time, we have not seen benthic impacts increasing; we have actually seen them decreasing. This is due to many factors such as new feeds with better digestibility and food conversion rates, more monitoring to reduce waste of feed (e.g.

underwater cameras), shifting to circle cage arrays which allow more water flow, moving sites deeper offshore and/or in areas with faster currents, and adding extra cages (as above) without adding more tonnage. This allows waste impacts to be less intense on the seabed and faster remediation. We see 80-90% of sites stocking production cycle after production cycle while still staying under set environmental thresholds, which aligns with our sustainability objectives. If the thresholds are exceeded, a mandatory fallowing period is implemented. Monitoring over time has continued to demonstrate that peak biomass is a more relevant predictor of benthic impact than total production harvested.

We continue to licence peak biomass and have industry monitor within 30 days of that window. Additionally, DFO staff field audit benthic performance at >20% of active farms every year. Our data aligns very well with industry results, and we post this information on our website. Total harvested production has often exceeded peak biomass production over the time DFO has been using this metric for management, so there is no extra regulation being considered to manage it now. Benthic health is always a priority for the Department, and sites have been continuing to improve their performance over time. At this time, water quality is not being measured because research conducted in the early 2000s indicated that impacts could not be detected very far from cage edges. However, some new work is being conducted through a national DFO-Science initiative called the Aquaculture Monitoring Program and water quality testing will likely be initiated this year at finfish aquaculture sites to determine if this is still correct. Water quality testing around shellfish farms began two years ago. We would be happy to provide you with additional information if you are interested.

PRV and the Federal Court decision

The Department is in the process of developing its response to the Federal Court decision and the most recent science work related to *piscine reovirus*. We would be pleased to speak to you about this approach in a future meeting.

We look forward to meeting you on Monday, April 8 to discuss these matters further.

Sincerely,

Brenda McCorquodale
Manager, Aquaculture Management Division
Fisheries and Oceans Canada

Maley, Shelley

From: Rainer, Michelle
Sent: April-03-19 10:13 AM
To: Waddington, Zac; Paylor, Adrienne
Cc: McConnachie, Sarah
Subject: RE: Media lines for approval
Attachments: 2019.CA.Sea Lice Lufenuron Media Release.pdf

No worries, Zac. Sarah helped me with this and I think we ticked all your boxes. Here are the draft lines; please let me know if you have any concerns.

Michelle

Media lines

- The abundance of sea lice on marine salmon farms is influenced by seasonal and year-to-year variations in ocean salinity and temperature, as well as the number and species of wild salmon returning to an area. **Approved**
- In Clayoquot sound over the winter/spring of 2017-2018, the typical drop in salinity that comes with rains did not occur. This higher salinity resulted in increased lice production in the region and exacerbated the lice levels on farms. **Approved**
- In early 2018, Fisheries and Oceans Canada (DFO) collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed emamectin benzoate (SLICE®) resistance. **Approved**
- Due to continuing high ocean salinity in 2019, there is concern that sea lice levels may once again be high during the critical juvenile outmigration period this spring. DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the outmigration period and that its licence requirements are understood and followed. **New**
- Health Canada has issued an emergency drug release (EDR) to Cermaq Canada for the use of Lufenuron. Drugs used in salmon aquaculture are approved and managed by Health Canada. **new**
- Lufenuron is used widely and safely in veterinary medicine as a topical flea/parasite preventative for dogs and cats. **new**
- When used to treat salmon, it is not administered in the ocean environment. Rather, fish are treated in land-based, freshwater facilities prior to transfer to marine sites. **New**
- DFO was not involved in the application or review process for the Lufenuron EDR but we were notified by Cermaq Canada of its use in their sea lice mitigation plan. DFO supports the use of varied treatment applications to ensure that sea lice resistance to available drugs does not become a widespread problem. Varied treatment choices are consistent with a responsible integrated pest management approach to sea lice mitigation. **new**
- Upon ocean entry, the fish should be protected from sea lice infestation for up to 6 to 9 months, thus reducing reliance on and other treatments that may be stressful to fish. **new**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**

Responsive on results of investigation

- The Department has reviewed Cermaq Canada's sea lice management practices in this region and, in March 2019, issued a warning letter to Cermaq Canada Ltd. for violation of certain conditions of licence. In total, 7 compliance issues were found. **new**
- DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the upcoming wild salmon out migration period and that its licence requirements are understood and followed. **new**

From: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>

Sent: April-01-19 4:38 PM

To: Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>; Rainer, Michelle <Michelle.Rainer@dfo-mpo.gc.ca>

Cc: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>

Subject: Re: Media lines for approval

Sorry I tried to send out this email before I left Vancouver. But my outlook between my phone and computer doesn't seem to be syncing. Here's what I had wrote:

I am just about to leave Vancouver for Ottawa so I won't have email for a while. But essentially the key take away points in my mind are:

Imvixa (lufenuron) is only used in hatchery, the drug confers resistance to sea lice infestation for 6-9 months thereafter. The Veterinary Drug Directorate (VDD) of Health Canada (not DFO) is responsible for authorizing any Emergency Drug Releases.

VDD informed DFO veterinarians about the application to use this drug in BC and DFO supported the application.

There is little to no deposition of the drug into the marine environment since it is highly fat bound in the tissues of the fish.

This same drug is used commonly in cat and dog flea and tick medication.

The EDR stipulates monitoring of the benthos as a condition of the licences (I can't remember the exact condition, but I can get that later today hopefully).

Hope that helps,

Zac

----- Original message -----

From: "Paylor, Adrienne" <Adrienne.Paylor@dfo-mpo.gc.ca>

Date: 2019-04-01 6:30 PM (GMT-05:00)

To: "Rainer, Michelle" <Michelle.Rainer@dfo-mpo.gc.ca>

Cc: "McConnachie, Sarah" <Sarah.Mcconnachie@dfo-mpo.gc.ca>, "Waddington, Zac" <Zac.Waddington@dfo-mpo.gc.ca>

Subject: Re: Media lines for approval

Thanks Michelle,

Can you change the second last bullet to say a warning letter was issued for violation of certain conditions of license instead of "failing to comply with conditions of license".....I just think it sounds too generic like they didn't comply with any CoL.

Also I think we should move up the point that the new treatment is land based and not going into the ocean right after bullet 5. What do you think?

Otherwise approved thanks.
Adrienne

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Rainer, Michelle
Sent: Monday, April 1, 2019 5:48 PM
To: Paylor, Adrienne
Subject: Media lines for approval

Hi Adrienne,

Sarah has approved these. Ready for your review—I've also sent these to Clare Doucette for review of the C&P portion.

Thanks,
Michelle

**Pages 313 to / à 314
are duplicates of
sont des duplicatas de la
page 265**

Maley, Shelley

From: Fenton, AJ
Sent: April-04-19 7:49 AM
To: Waddington, Zac; McConnachie, Sarah
Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?
Attachments: 17-062 Letter to [REDACTED] re sea lice management.pdf

Thanks to you both, appreciate the revisions.

RE: requiring licence holder to harvest, is that not part of the CoL? Here's a letter related to this. [REDACTED]
[REDACTED] Let me know what you think.

Cheers,
A.J.

From: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Sent: Wednesday, April 3, 2019 4:20 PM
To: Fenton, AJ <AJ.Fenton@dfo-mpo.gc.ca>; McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Thanks a bunch for that Sarah. It looks really good, the only changes I would make are below in red

SLICE® (emamectin benzoate) is a commonly used chemotherapeutant licensed for sea lice management in farmed salmonids. In BC, SLICE® resistance has emerged in some farmed Atlantic salmon populations, necessitating the development of alternative treatments to prevent wide-spread resistance. Having alternative treatment options is a key feature of Integrated Pest Management and involves numerous methods of controlling and reducing sea lice in order to reduce reliance on chemotherapeutants and prevent the development of resistance. Some examples include the rotational use of alternative treatment methods such as novel in-feed pesticides, hydrogen peroxide baths and/or mechanical sea lice removal (e.g. using freshwater baths). ~~An alternate method approved by DFO to reduce the quantity of sea lice at a particular site is to require the licence holder to harvest the fish.~~ [REDACTED]
[REDACTED]

From: Fenton, AJ <AJ.Fenton@dfo-mpo.gc.ca>
Sent: April-03-19 2:45 PM
To: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Cc: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Hi Sarah, thanks very much for the quick reply. That is very helpful and appreciate you breaking down each point for me. ☺

Sincerely,
A.J.

s.19(1)
s.21(1)(a)
s.21(1)(b)

From: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>

Sent: Wednesday, April 3, 2019 2:43 PM

To: Fenton, AJ <AJ.Fenton@dfo-mpo.gc.ca>

Cc: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>

Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Hey there – I can give it a quick edit. Zac chime in if anything is totally wrong. See below:

- For SLICE®, place the registered demarcation afterwards for tradename (SLICE®)
- Use the term “chemotherapeutant” rather than “pesticide” (the province manages pesticides such as hydrogen peroxide, where Health Canada manages anti-parasite “drugs”, so important to differentiate in reporting. Pesticides are generally used in bath treatments vs in-feed medication)
- I would not state that sea lice resistance has emerged in any wild population, this has not been documented (unless you have heard otherwise?). To the best of my knowledge, resistance has only been documented in farmed salmonid populations. Additionally, only Atlantic salmon are treated with anti-parasiticides

With the above changes in mind, this is how I would word the paragraph:

SLICE® (emamectin benzoate) is a commonly used chemotherapeutant licensed for sea lice management in farmed salmonids. In BC, SLICE® resistance has emerged in some farmed Atlantic salmon populations, necessitating the development of alternative treatments to prevent wide-spread resistance. Having alternative treatment options is termed Integrated Pest Management and involves the rotational use of alternative treatment methods such as novel in-feed pesticides, hydrogen peroxide baths and/or mechanical sea lice removal (e.g. using freshwater baths). An alternate method approved by DFO to reduce the quantity of sea lice at a particular site is to require the licence holder to harvest the fish.

From: Fenton, AJ

Sent: April-03-19 2:06 PM

To: McConnachie, Sarah

Cc: Waddington, Zac

Subject: FW: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Hi Sarah, is this something you might be able to help with in Zac's absence or should I wait for him to get back? He had suggested adding a section on SLICE resistance to our finfish annual report and this is what we came up with. Wanted to groundtruth it and ensure that it's not inaccurate...

Cheers

A.J.

From: Fenton, AJ

Sent: Wednesday, April 3, 2019 12:01 PM

To: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>

Subject: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

SLICE RESISTANCE

SLICE (emamectin benzoate) is a commonly used pesticide for sea lice management. In some areas in BC, SLICE resistance has emerged in both farmed and wild salmon populations, necessitating development of alternative treatments to prevent wide-spread resistance in the sea lice population in BC. This involves the rotational use of alternative treatment methods such as novel in-feed pesticides, hydrogen peroxide baths

and/or mechanical sea lice removal (e.g. using freshwater baths). An alternate method used by DFO to reduce the quantity of sea lice at a particular site is to require the licence holder to harvest the fish.

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Fisheries and Oceans
Canada

Regional Director General
Pacific Region
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V6C 3S4

Pêches et Océans
Canada

Directrice générale régionale
Région du Pacifique
Piec 200 – 401 rue Burrard
Vancouver (C.-B.)
V6C 2V3S4

Your file Votre référence

Our file Notre référence
2017-502-00062

[REDACTED]
Grieg Seafood Ltd.
106 - 1180 Ironwood Street
Campbell River, BC V9W 5P7
Sent via email: [REDACTED]
[REDACTED]

**RE: Sea Lice Management at Esperanza
 and Steamer Point Sites, AQFF 1863 and 1079**

The Department has reviewed your letter of February 27, 2017 which outlines your planned remediation for these two farms. I am very concerned that the timelines you have outlined do not address the sea lice exceedances at these farms quickly enough.

The harvesting of fish at Steamer is planned at a rate of two pens per week. These two sites have 28 pens and if all are fully stocked, harvesting of all fish would require 14 weeks and would not be completed until approximately the week of May 29th. I appreciate the challenges involved in setting up new infrastructure to undertake peroxide treatments, however, I am informed that you have been aware of the extent of the sea lice issues at these sites since late October 2016.

Sea lice numbers at these sites are over 15 times higher than the threshold. This cannot be permitted to continue into the period when juvenile wild salmon are in proximity to these two farms. Our veterinarians advise that with lice counts this high the peroxide treatment is unlikely to reduce sea lice enough to achieve the lice threshold.

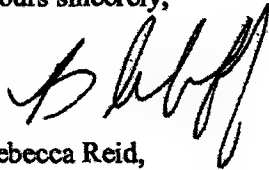
I am therefore advising you that all efforts must be taken immediately to accelerate harvesting and to implement peroxide treatment at these two farms and that harvesting should continue on an accelerated schedule until these farms have been emptied.

s.19(1)

Canada

Please contact Karen Calla at (604) 666-7009 if you have any questions.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Rebecca Reid', written over the printed name.

Rebecca Reid,
Regional Director General
Pacific Region

MAR 17 2017

cc: Andrew Thomson, Ecosystems and Fisheries Management
Mike Carlson, Conservation and Protection

Maley, Shelley

From: Webb, Allison
Sent: April-04-19 9:53 AM
To: Rainer, Michelle
Subject: Re: For approval: Lufeneron / Sea lice in Clayoquot

Please check my email from Tues where I provided comments to on this before approval. I received your out of office and hadn't heard back. Thx, Allison

Sent from my BlackBerry 10 smartphone on the Bell network.

From: Rainer, Michelle
Sent: Thursday, April 4, 2019 12:46 PM
To: Webb, Allison
Subject: FW: For approval: Lufeneron / Sea lice in Clayoquot

Hi Allison,
Just following up on approval for this.
Thanks,
Michelle

From: Rainer, Michelle
Sent: April-01-19 3:47 PM
To: Webb, Allison <Allison.Webb@dfo-mpo.gc.ca>
Subject: For approval: Lufeneron / Sea lice in Clayoquot

Issue: [REDACTED] Business in Vancouver ([REDACTED]) Looking for information on Cermaq Canada's use of Lufeneron to treat sea lice. Clayoquot Action has issued a press release (attached) and a group called Salmon People has started a letter writing campaign. There have been concerns about sea lice levels in Clayoquot Sound over the past year and last year Cermaq's farms in the area had high lice levels during the wild salmon outmigration period.

Deadline: April 2, noon PST

Recommendation: email response

Approved by: Sarah McConnachie, Claire Doucette, Adrienne Paylor

- The abundance of sea lice on marine salmon farms is influenced by seasonal and year-to-year variations in ocean salinity and temperature, as well as the number and species of wild salmon returning to an area. **Approved**
- In Clayoquot sound over the winter/spring of 2017-2018, the typical drop in salinity that comes with rains did not occur. This higher salinity resulted in increased lice production in the region and exacerbated the lice levels on farms. **Approved**
- In early 2018, Fisheries and Oceans Canada (DFO) collected sea lice from Cermaq Canada's Bawden site in the Clayoquot area and sent them to the BC Centre for Aquatic Health Sciences for analysis, which confirmed emamectin benzoate (SLICE®) resistance. **Approved**
- Due to continuing high ocean salinity in 2019, there is concern that sea lice levels may once again be high during the critical juvenile outmigration period this spring. DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the outmigration period and that its licence requirements are understood and followed. **New**

- Health Canada has issued an emergency drug release (EDR) to Cermaq Canada for the use of Lufenuron. Drugs used in salmon aquaculture are approved and managed by Health Canada. **new**
- Lufenuron is used widely and safely in veterinary medicine as a topical flea/parasite preventative for dogs and cats. **new**
- When used to treat salmon, it is not administered in the ocean environment. Rather, fish are treated in land-based, freshwater facilities prior to transfer to marine sites. **New**
- DFO was not involved in the application or review process for the Lufenuron EDR but we were notified by Cermaq Canada of its use in their sea lice mitigation plan. DFO supports the use of varied treatment applications to ensure that sea lice resistance to available drugs does not become a widespread problem. Varied treatment choices are consistent with a responsible integrated pest management approach to sea lice mitigation. **new**
- Upon ocean entry, the fish should be protected from sea lice infestation for up to 6 to 9 months, thus reducing reliance on and other treatments that may be stressful to fish. **new**
- Under the Pacific Aquaculture Regulations, DFO requires salmon farming companies to regularly monitor and manage sea lice levels at their facilities in BC. DFO also regularly conducts assessments of sea lice abundance at these facilities. **approved**
- Companies in BC must submit a lice reduction plan if monitoring shows sea lice levels higher than three motile sea lice per farmed fish during the wild salmon outmigration period from March 1 to June 30 of each year. Motile lice are those at the free-moving stages of their life cycle. **approved**

Responsive on results of investigation

- The Department has reviewed Cermaq Canada's sea lice management practices in this region and, in March 2019, issued a warning letter to Cermaq Canada Ltd. for violation of certain conditions of licence. In total, 7 compliance issues were found. **new**
- DFO is working closely with Cermaq Canada staff to ensure that the company is prepared for the upcoming wild salmon out migration period and that its licence requirements are understood and followed. **new**

Maley, Shelley

From: Fenton, AJ
Sent: April-04-19 10:25 AM
To: Waddington, Zac; McConnachie, Sarah
Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Thanks Zac, that's great for clarity. I've left the sentence out as you indicated.

A.J.

From: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Sent: Thursday, April 4, 2019 10:08 AM
To: Fenton, AJ <AJ.Fenton@dfo-mpo.gc.ca>; McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

It's an ongoing issue that we are having with out sea lice CoLs. We require that industry provide a plan to mitigate lice over threshold, and their plan may be harvest which is acceptable to us. [REDACTED]

Zac

From: Fenton, AJ <AJ.Fenton@dfo-mpo.gc.ca>
Sent: April-04-19 7:49 AM
To: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>; McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Thanks to you both, appreciate the revisions.

RE: requiring licence holder to harvest, is that not part of the CoL? Here's a letter related to this. [REDACTED]
[REDACTED] Let me know what you think.

Cheers,
A.J.

s.21(1)(a)
s.21(1)(b)
s.23

From: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Sent: Wednesday, April 3, 2019 4:20 PM
To: Fenton, AJ <AJ.Fenton@dfo-mpo.gc.ca>; McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Thanks a bunch for that Sarah. It looks really good, the only changes I would make are below in red

SLICE® (emamectin benzoate) is a commonly used chemotherapeutant licensed for sea lice management in farmed salmonids. In BC, SLICE® resistance has emerged in some farmed Atlantic salmon populations, necessitating the development of alternative treatments to prevent wide-spread resistance. Having alternative

treatment options is a key feature of Integrated Pest Management and involves numerous methods of controlling and reducing sea lice in order to reduce reliance on chemotherapeutants and prevent the development of resistance. Some examples include the rotational use of alternative treatment methods such as novel in-feed pesticides, hydrogen peroxide baths and/or mechanical sea lice removal (e.g. using freshwater baths). ~~An alternate method approved by DFO to reduce the quantity of sea lice at a particular site is to require the licence holder to harvest the fish.~~

From: Fenton, AJ <AJ.Fenton@dfo-mpo.gc.ca>
Sent: April-03-19 2:45 PM
To: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Cc: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Hi Sarah, thanks very much for the quick reply. That is very helpful and appreciate you breaking down each point for me. ☺

Sincerely,
A.J.

From: McConnachie, Sarah <Sarah.Mcconnachie@dfo-mpo.gc.ca>
Sent: Wednesday, April 3, 2019 2:43 PM
To: Fenton, AJ <AJ.Fenton@dfo-mpo.gc.ca>
Cc: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>
Subject: RE: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Hey there – I can give it a quick edit. Zac chime in if anything is totally wrong. See below:

- For SLICE®, place the registered demarcation afterwards for tradename (SLICE®)
- Use the term “chemotherapeutant” rather than “pesticide” (the province manages pesticides such as hydrogen peroxide, where Health Canada manages anti-parasite “drugs”, so important to differentiate in reporting. Pesticides are generally used in bath treatments vs in-feed medication)
- I would not state that sea lice resistance has emerged in any wild population, this has not been documented (unless you have heard otherwise?). To the best of my knowledge, resistance has only been documented in farmed salmonid populations. Additionally, only Atlantic salmon are treated with anti-parasiticides

With the above changes in mind, this is how I would word the paragraph:

SLICE® (emamectin benzoate) is a commonly used chemotherapeutant licensed for sea lice management in farmed salmonids. In BC, SLICE® resistance has emerged in some farmed Atlantic salmon populations, necessitating the development of alternative treatments to prevent wide-spread resistance. Having alternative treatment options is termed Integrated Pest Management and involves the rotational use of alternative treatment methods such as novel in-feed pesticides, hydrogen peroxide baths and/or mechanical sea lice removal (e.g. using freshwater baths). An alternate method approved by DFO to reduce the quantity of sea lice at a particular site is to require the licence holder to harvest the fish.

From: Fenton, AJ
Sent: April-03-19 2:06 PM

s.21(1)(a)
s.21(1)(b)

To: McConnachie, Sarah

Cc: Waddington, Zac

Subject: FW: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

Hi Sarah, is this something you might be able to help with in Zac's absence or should I wait for him to get back? He had suggested adding a section on SLICE resistance to our finfish annual report and this is what we came up with. Wanted to groundtruth it and ensure that it's not inaccurate...

Cheers

A.J.

From: Fenton, AJ

Sent: Wednesday, April 3, 2019 12:01 PM

To: Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>

Subject: Annual Report Sea Lice Resistance Text - Can you review and provide edits?

SLICE RESISTANCE

SLICE (emamectin benzoate) is a commonly used pesticide for sea lice management. In some areas in BC, SLICE resistance has emerged in both farmed and wild salmon populations, necessitating development of alternative treatments to prevent wide-spread resistance in the sea lice population in BC. This involves the rotational use of alternative treatment methods such as novel in-feed pesticides, hydrogen peroxide baths and/or mechanical sea lice removal (e.g. using freshwater baths). An alternate method used by DFO to reduce the quantity of sea lice at a particular site is to require the licence holder to harvest the fish.

Mollins, Jennifer

Subject: CRWG - DFO AMD meeting
Location: 1965 Island Diesel Way DFO Office, Nanaimo or teleconference 1-877-413-4781
Passcode [REDACTED]

Start: Mon 08/04/2019 1:00 PM
End: Mon 08/04/2019 4:00 PM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Organizer: McCorquodale, Brenda
Required Attendees: [REDACTED]
[REDACTED] Paylor, Adrienne;
Waddington, Zac; Shaw, Kerra; Taekema, Bernie John; Mollins, Jennifer;
[REDACTED]

Categories: Blue Category

One new participant added – April 3
Added response letter – April 5

—
Hello all

Please find attached a draft agenda for the meeting on Monday and the correspondence from the CRWG to DFO. We hope to have the response to you in the next day or so.



Agenda DFO
CRWG April 8 20... Xerox Multifunc...



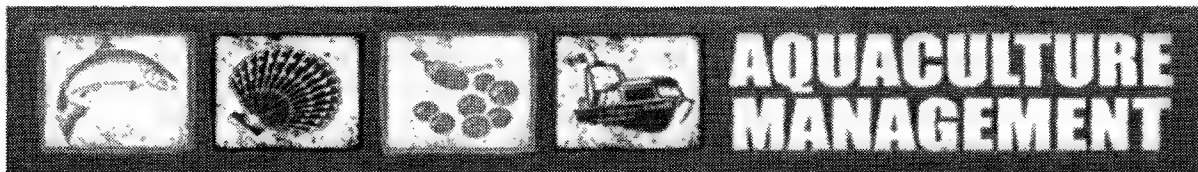
Scanned from a



Letter to Brenda
McCorquodale _

s.16(2)(c)

s.19(1)



Fisheries and Oceans Canada (DFO) and Conservation Regulatory Working Group Meeting	
Meeting Date	Monday April 8, 2019 from 1pm to 3pm
Location	1965 Island Diesel Way, Nanaimo or teleconference 1-877-413-4781 Code : [REDACTED]
Objective	Marine finfish aquaculture management
Invited Participants :	
Conservation Regulatory Working Group	
[REDACTED]	David Suzuki Foundation
[REDACTED]	Watershed Watch Salmon Society
[REDACTED]	Georgia Strait Alliance
[REDACTED]	Living Oceans Society
[REDACTED]	Tides Canada
[REDACTED]	Wild Salmon Forever
DFO	
Adrienne Paylor	Manager, Aquaculture Environmental Operations
Zac Waddington	Lead Veterinarian, Aquaculture Environmental Operations
Kerra Shaw	Senior Biologist, Aquaculture Environmental Operations
Brenda McCorquodale	Manager, Aquaculture Resource Management
Bernie Taekema	Senior Coordinator, Aquaculture Resource Management
Jennifer Mollins	Senior Coordinator, Aquaculture Resource Management
Draft AGENDA	
1.	Welcome and review agenda
2.	Sea lice management
3.	Licensed Farm Biomass <ul style="list-style-type: none"> • Modelling and site selection • Peak biomass monitoring
4.	Future meetings

Draft as of April 2, 2019

s.16(2)(c)

s.19(1)

**Pages 327 to / à 329
are duplicates of
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page 139**



**Fisheries and Oceans
Canada**

Pacific Region
1965 Island Diesel Way
Nanaimo, BC
V9S 5W8

**Pêches et Océans
Canada**

Région du Pacifique
1965 Island Diesel Way
Nanaimo (C.-B.)
V9S 5W8

April 5, 2019

Ms. Karen Wristen, Executive Director
Living Oceans Society
1407-207 Hastings St W,
Vancouver BC V6B 1H7

Dear Ms. Wristen,

RE: MARINE FINFISH AQUACULTURE MANAGEMENT CONCERNS

Thank you for your letter of February 12, 2019 written on behalf of the Conservation Regulatory Working Group. Your input is appreciated, and we are glad to be able to have the opportunity both to respond to these concerns and to meet next week in person to continue this dialogue.

Sea lice management

As you have highlighted, sea lice management and sea lice resistance are significant issues and are important priorities for Fisheries and Oceans Canada (the Department). Monitoring sea lice levels and preventing the development of sea lice resistance or adaptation to treatments is a marine finfish aquaculture management and science priority. Are you aware the Department conducts both sea lice audits on marine finfish farms and undertakes research into sea lice levels on wild fish.

We continue to explore and adopt improved ways of managing aquaculture. For example, on December 18, 2018 the Minister of Fisheries and Oceans Canada announced a renewed approach to aquaculture management, including moving towards an area-based approach to aquaculture management (<https://www.canada.ca/en/fisheries-oceans/news/2018/12/government-of-canada-announces-new-way-forward-on-aquaculture-management-and-the-protection-of-wild-salmon.html>). Area based aquaculture management will facilitate new approaches which could include a move toward managing aggregate levels of sea lice on farms or within areas that may have hydrological connectivity.

The Department is also taking an area-specific management approach to sea lice in some areas with abundant sea lice. As a part of planning with industry to reduce sea lice

Canada

abundance and resistance in Clayoquot Sound, all smolts since the 2018 outmigration have been treated with the drug Imvixa in the hatchery. This drug confers 6-9 months of sea lice resistance to treated fish. For the three remaining sites, sea lice management plans include approaches to facilitate either harvest and/or peroxide treatments in order to remain below the federal marine finfish aquaculture sea lice threshold requirements.

We are not aware of any interest from industry to apply to use Azamethiphos for treatment of gill disease in BC. Should they apply to use this treatment, we would be consulted through the Emergency Drug Release process. As you state, this process takes many months, and would not likely occur for the 2019 salmon outmigration. However, we appreciate hearing about the possibility that treatments with Azamethiphos may counter-indicate the use of hydrogen peroxide baths, and will explore this further.

SLICE resistant sea lice have now been found in several marine finfish aquaculture areas, however they do not appear to be spreading from one geographic area to another. The current evidence is that the small sub-population of lice with a naturally occurring resistance to SLICE is selected for and becomes dominant in a farm or farming area when SLICE is used repeatedly. Through the use of Imvixa, and in the future through additional management and planning, the Department believes that replenishment of the population with non-resistant lice, and with a management regime that utilizes multiple treatments and approaches, should allow areas to return to non-resistant populations where SLICE could be used effectively as one sea lice management tool ("it could be hypothesized that dilution by large numbers of naïve lice from returning hosts could inhibit the establishment and spread of any such advantageous mutation should it emerge in the Pacific." (Besnier et al., 2014; Jacobsen et al., 2012)).

Licensed biomass

As noted in your letter, marine finfish aquaculture licences do indicate a maximum peak biomass. Although the provincial government used to licence total production harvested off the farm, the Department does not licence in this manner. We licence peak biomass, which is the maximum amount of standing tonnage on a farm during a production cycle, because this is the time of greatest environmental impact. The Department and industry interpret this in the same way; sites are "allowed" to harvest more off of the farm than is on the face of their licence, as long as they do not exceed their peak biomass at any time during a production cycle. We have licenced and defined tonnage in this same way when Section 35(2) Authorizations were issued under the *Fisheries Act* from 2003-2010, and then through licence conditions from 2010 onward.

As you have noted, there is an increasing trend of adding cages to arrays without tonnage increases. This occurs because decreasing fish stocking/growing densities and adding more ability for water flow has been demonstrated to increase fish health and growth rates. It also decreases the intensity of organic loading on the seabed, which helps with

remediation times. This approach is beneficial for both aquaculturists and the environment, and is supported by the Department.

Modeling and site selection

In your letter, you ask if farms are required to conduct additional modeling to estimate the impacts of the additional biomass over the period of a single grow-out cycle.

As previously stated, since initiating the use of DEPOMOD in BC, the metric of peak biomass has always been used as an input, which aligns with how we licence tonnage, and we have never used the metric of total production taken off a site. We enter the greatest standing tonnage expected (the peak biomass) along with the greatest feed rates to predict the worst case scenario impact on the seabed. This continues to be used in siting decisions to understand where and how impacts are expected to occur, along with where operational monitoring should occur. The Department acknowledges that sites can harvest more tonnage from a farm than the tonnage on the face of their licence, and we do not interpret this to be an exceedance or a violation of the licence, as it is a different metric than what is licenced. We have had this management approach since 2003, and as this model already uses peak biomass, we do not use additional modelling required to understand how impact occurs. Monitoring over time has continued to demonstrate that peak biomass is a more relevant predictor of benthic impact than total production harvested.

Peak Biomass Monitoring

You asked about the timing of the sampling for peak biomass at marine finfish aquaculture sites. The Department recognizes that peak biomass is sustained for weeks to months, rather than a single moment in time. In recent years, companies have been harvesting over a longer time than formerly, partly because companies no longer regularly "grade" fish during production cycles to avoid unnecessary handling. Instead, they harvest the biggest fish from each pen, leaving the smaller fish to grow for a few months. Additionally, this can allow a company to provide fish to markets 365 days a year because harvests are occurring almost constantly at least one at of their farms. And finally, with very few new sites being added in recent years, companies are trying to optimize the amount of fish they can harvest from sites while still meeting environmental thresholds, such as sea lice and benthic impacts.

Although peak biomass can be prolonged, there is always a single day that is predicted to be the actual peak due to feed inputs and biomass estimates. As has been the case since 2002, licence holders must monitor the sea bed within 30 days either side of that date. If they monitor once around that date but hold fish long enough that a second larger peak is reached, they must monitor again to be in compliance with the *Aquaculture Activities Regulations*. Over time, we have not seen benthic impacts increasing; we have actually seen them decreasing. This is due to many factors such as new feeds with better digestibility and food conversion rates, more monitoring to reduce waste of feed (e.g.

underwater cameras), shifting to circle cage arrays which allow more water flow, moving sites deeper offshore and/or in areas with faster currents, and adding extra cages (as above) without adding more tonnage. This allows waste impacts to be less intense on the seabed and faster remediation. We see 80-90% of sites stocking production cycle after production cycle while still staying under set environmental thresholds, which aligns with our sustainability objectives. If the thresholds are exceeded, a mandatory fallowing period is implemented. Monitoring over time has continued to demonstrate that peak biomass is a more relevant predictor of benthic impact than total production harvested.

We continue to licence peak biomass and have industry monitor within 30 days of that window. Additionally, DFO staff field audit benthic performance at >20% of active farms every year. Our data aligns very well with industry results, and we post this information on our website. Total harvested production has often exceeded peak biomass production over the time DFO has been using this metric for management, so there is no extra regulation being considered to manage it now. Benthic health is always a priority for the Department, and sites have been continuing to improve their performance over time. At this time, water quality is not being measured because research conducted in the early 2000s indicated that impacts could not be detected very far from cage edges. However, some new work is being conducted through a national DFO-Science initiative called the Aquaculture Monitoring Program and water quality testing will likely be initiated this year at finfish aquaculture sites to determine if this is still correct. Water quality testing around shellfish farms began two years ago. We would be happy to provide you with additional information if you are interested.

Other Issues

As discussed vis email, we will work with you to set up meetings to discuss the other items of interest to the Conservation Regulatory Working Group.

We look forward to meeting you on Monday, April 8 to discuss these matters further.

Sincerely,



Brenda McCorquodale
Manager, Aquaculture Management Division
Fisheries and Oceans Canada

**Fisheries and Oceans Canada (DFO)
Conservation Regulatory Working Group (CRWG)
Meeting April 8, 2019
DFO boardroom, 1965 Island Diesel Way, Nanaimo**

Materials Distributed:

- Letter from Living Oceans to DFO, February 12, 2019
- Response letter from DFO, April 5, 2019

Participants:

Fisheries and Oceans Canada:

Adrienne Paylor, Manager, Aquaculture Environmental Operations
Zac Waddington, Lead Veterinarian, Aquaculture Environmental Operations
Kerra Shaw, Senior Biologist, Aquaculture Environmental Operations
Brenda McCorquodale, Manager, Aquaculture Resource Management
Bernie Taekema, Senior Coordinator, Aquaculture Resource Management
Jennifer Mollins, Senior Coordinator, Aquaculture Resource Management

Conservation Regulatory Working Group:

[REDACTED] Living Oceans Society
[REDACTED] Watershed Watch Salmon Society
[REDACTED], Suzuki Foundation
[REDACTED] Tides Canada
[REDACTED] Georgia Strait Alliance
[REDACTED] Wild Salmon Forever

Record of Discussion

The meeting started off with a general discussion about the history of DFO and the Conservation Regulatory Working Group, including discussions related to the development of a Terms of Reference for the Marine Finfish Aquaculture Management Advisory Committee (AMAC). This committee has been on hiatus since 2016. CRWG members indicated they are interested in continuing bi-lateral meetings with DFO on aquaculture management, and are also open to participating in meetings occasionally with First Nations and/or industry.

Sea lice management

DFO reviewed situation with sea lice management in Clayoquot Sound which led to challenges in 2018. Measures are being taken by industry to avoid a recurrence, such as

- employing a hydrolicer that removes lice, which are then captured and incinerated on a barge. This technology was available in 2018.
- Juvenile salmon are now being treated with Invicta at the hatchery, which prevents sea lice from forming on the salmon for up to 9 months.

Peroxide treatments that were planned by industry and approved by DFO were delayed due to public concern and BC consultations process, and a well-boat wasn't available in a timely manner.



CWRG indicated concern that the Bear Bluff facility is over the threshold, and there may be an issue with sea lice again this year. DFO responded that harvesting was completed at that site on April 1.

DFO indicated that the sea lice occurrence at Clayoquot may be studied to help determine the population-level impacts of sea lice on salmon by studying the returning stocks to that area. DFO has hired an epidemiologist, who will assess trends of sea lice and pathogens. This can be looked at alongside wild stock population information.

DFO is moving to an area based management approach, employing models to assess hydro-connectivity of farms that could transfer sea lice. DFO's FVCOM model, among other tools, is being used. This information will help to create improved marine finfish aquaculture licence conditions for the 2022, possibly including more performance based conditions.

CRWG members were concerned with DFO's sea lice approach, and urged DFO to be more conservative. CRWG members stated that lower lice levels will protect wild fish, and stated that mechanical and peroxide treatments will more effective at lower lice loads. CRWG members stated that drugs should be used sparingly to avoid drug resistance. Treating at commencement of smolt migration would result in better wild salmon protection and is preferred by the CRWG.

CRWG members asked if the lice threshold is under review. There was a discussion about female adult lice thresholds as an alternative to motile lice levels.

CRWG members asked how DFO manages Caligus. DFO indicated that do not intend to control for Caligus sea lice as they have not been demonstrated to be problematic and are typically quite temporal in nature. CRWG expressed concern about Caligus lice impacting herring and salmon. DFO noted that records are kept on levels of this species, but industry is not required to manage these levels.

CRWG is concerned that DFO is using scientific uncertainty to delay decisions that protect wild salmon from aquaculture. CRWG referenced the following paper and suggested DFO review:
<http://policyoptions.irpp.org/magazines/april-2018/integrity-of-the-dfos-science-advisory-process-in-question/>

There was a discussion about what the requirement would be to change the aquaculture licence conditions prior to 2022, and what level of harm would meet the bar for 'conservation concerns'. DFO notes that Science 'bulletins' may also be used issued to clarify licence requirements within the current licencing period.

DFO is working with First Nations to identify on-site monitoring and potentially regulatory role.

CWRG indicated that audits should be unannounced, where possible, to make them effective, citing a paper which found small differences in reports from industry when DFO was present for audits.

Peak biomass

There was a discussion about peak biomass as opposed to production limits. DFO confirmed that it manages for peak biomass at a site, and acknowledged that peak biomass could be sustained for some period time as fish are harvested and others within the pen continue to grow. DFO noted that if

a second peak is reached, monitoring is again required. If benthic baseline conditions are not met, the farm cannot restock until the site recovers. DFO also noted that there are random audits done on benthic impacts which do not statistically differ from information submitted by industry. CRWG asked for more detailed information related to benthic performance results.

Action: DFO (Kerra) and CRWG () to discuss further options for sharing benthic information more detailed than what is on the public reporting website.

Enforcement

- The CRWG members requested additional information on enforcement including what is being audited, where are enforcement efforts being targeted and what is being found.

Next steps

CRWG indicated interest in meeting again soon to discuss further topics, as feel this meeting was productive. Next meeting topics:

- Processing and hatchery effluent (invite Government of BC) (recommended by CRWG)
- Drug and pesticide use (recommended by CRWG)
- Aquaculture Act(recommended by DFO)

CRWG noted that they want to be involved early in policy development, rather than commenting on a draft of the Act that has already been written.

DFO to do up minutes and organize another meeting.

s.19(1)



Fisheries and Oceans Canada (DFO) and Conservation Regulatory Working Group Meeting Record (DRAFT)	
Meeting	Monday April 8, 2019 from 1pm to 3pm
Location	1965 Island Diesel Way, Nanaimo or teleconference 1-877-413-4781 Code [REDACTED]
Objective	Marine finfish aquaculture management
Materials distributed	Letter from Living Oceans to DFO, February 12, 2019 Response letter from DFO, April 5, 2019
Participants :	
Conservation Regulatory Working Group	
[REDACTED]	David Suzuki Foundation
[REDACTED]	Watershed Watch Salmon Society
[REDACTED]	Georgia Strait Alliance
[REDACTED]	Living Oceans Society
[REDACTED]	Tides Canada
[REDACTED]	Wild Salmon Forever
DFO	
Adrienne Paylor	Manager, Aquaculture Environmental Operations
Zac Waddington	Lead Veterinarian, Aquaculture Environmental Operations
Kerra Shaw	Senior Biologist, Aquaculture Environmental Operations
Brenda McCorquodale	Manager, Aquaculture Resource Management
Bernie Taekema	Senior Coordinator, Aquaculture Resource Management
Jennifer Mollins	Senior Coordinator, Aquaculture Resource Management

Record of Discussions/Decisions

1) Roundtable introductions / opening comments

- Meeting to discuss concerns outlined in letter.
- Brenda met with Conservation Regulatory Working Group prior, when establishing a Terms of Reference for the Aquaculture Management Advisory Committees (AMAC). Marine Finfish AMAC on hiatus since 2016, current priority on bilateral meetings with First Nations via the First Nations Fisheries Council of BC
- [REDACTED] indicated bi-lateral meeting with DFO on aquaculture management are preferable for the CRWG, and is open to participating in multi-stakeholder meetings occasionally.

s.16(2)(c)

s.19(1)

2) Sea lice management

- Zac reviewed recent approaches to managing sea lice in Clayquot Channel, including
 - o An approved sea lice management plan is required prior to restocking
 - o Cermaq's hydro de-licer mechanically removes lice, which are then captured and incinerated on a barge



Fisheries and Oceans
Canada

Pêches et Océans
Canada



- o New stock treated the Avixer at the hatchery, which prevents sea lice exoskeleton from forming for up to 9 months.
- o Peroxide treatments that were planned by industry and approved by DFO were delayed due to public concern and BC consultations process.
- [REDACTED] indicated concern that Bear Bluff was over the limit. Zac responded that harvesting was completed at that site on April 1.
- Zac indicated that the sea lice occurrence at Clayquot may be studied to help determine the population-level impacts of sea lice on salmon by studying the returning stocks to that area.
- Adrienne indicated that DFO has hired an aquaculture epidemiologist, who will study sea lice impacts.
- Zac indicated that DFO is moving to an area based management approach, scaled at hydroconnectivity levels that connect locations for sea lice. DFO's FVCOM model is being used. Will use this information to create improved marine finfish aquaculture licence conditions for the 2022 issuance, to create performance based objectives.
- [REDACTED] indicated that research on sea lice in the Broughton Archipelago such as Peacock (2013) showed that treating to lower lice levels protects wild fish. A precautionary approach that lowers lice before migration would allow a safe migration period, so that the lice levels are lowered early instead of allowing levels to rise to the threshold and then treating less successfully.
- [REDACTED] asked if the lice threshold is under review. Zac responded that a female adult lice count may be preferable, due to counting ease and accuracy. Do not intend to control for Caligus sea lice as they leave the farm on their own. [REDACTED] indicated concern about caligus lice on herring and salmon stocks
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0016851> and Caligus and Lepeophtheirus sea lice on salmon stocks
<https://onlinelibrary.wiley.com/doi/full/10.1111/jfb.13325>
- [REDACTED] indicated that lower lice levels could be considered, as adopting mechanical and peroxide treatments that are more effective as preventative strategies as in sites with a heavy lice load, treated fish get re-infected. These treatments can only be used a few times on live aquaculture salmon before causing harm, and there is less risk of sea lice adapting to these measures. Treating at commencement of smolt migration would result in better wild salmon protection.
- [REDACTED] indicated concern that DFO is using scientific uncertainty to delay decisions that protect wild salmon from aquaculture. <http://policyoptions.irpp.org/magazines/april-2018/integrity-of-the-dfos-science-advisory-process-in-question/>
- There was a discussion about the requirements to change the aquaculture licence conditions prior to the 2022 issuance, and what level of harm would meet the bar for 'conservation concerns'. Licence 'bulletins' are issued to clarify licence requirements within the current licenced period.
- Brenda indicated DFO is working with First Nations to identify on-site monitoring and potentially regulatory role.
- [REDACTED] mentioned that some First Nations have high levels of skills and ability. Also, BC forestry has a code to create performance based regulations.
- [REDACTED] indicated that audits should be unannounced, where possible, to make them effective. Zac responded that for audits, DFO needs industry staff on hand to raise the fish out of the pens and thus prefers to organize audits in advance.

Commented [M31]: Is this the right reference?

3. Peak biomass

- Kerra confirmed that peak biomass at a marine finfish aquaculture site could endure for months, and that DFO manages on that basis. If benthic baseline conditions are not met, the farm cannot restock until the site recovers.
- ██████████ asked if DFO would publish their reports on benthic conditions. Kerra responded that the reports are available on request, due to low demand.

Action: Kerra to share marine finfish production and biomass reports (measured in different ways over time)

4. Next steps

- Next meeting topics:
 - o Processing and hatchery effluent (invite Government of BC) (recommended by CRWG)
 - o Drug and pesticide use (recommended by CRWG)
 - o Aquaculture Act(recommended by DFO)
- ██████████ commented that the CRWG wants to be involved early in policy development, rather than commenting on a draft

s.19(1)

Mollins, Jennifer

From: Mollins, Jennifer
Sent: April-23-19 8:27 AM
To: Paylor, Adrienne
Cc: McCorquodale, Brenda
Subject: REVIEW - CRWG meeting notes from April 8, 2019

Hi Adrienne – Please review our notes from the CRWG meeting from April 8. Kerra's feedback was included earlier.

Once they are OK with you, I'll circulate to the CRWG.

Jennifer

From: McCorquodale, Brenda <Brenda.McCorquodale@dfo-mpo.gc.ca>
Sent: April-19-19 2:13 PM
To: Mollins, Jennifer <Jennifer.Mollins@dfo-mpo.gc.ca>
Subject: RE: REVIEW - CRWG meeting notes from April 8, 2019



CRWG DFO April
8 2019 meeting _

Thanks Jennifer

I made a few changes.

Can you also put the PRV policy as a requested follow up item from CRWG.

Can you pull out the action items and start an action log table.

Recirculate to Adrienne for her approval . then we can circulate to CRWG. Maybe we can set up another meeting for late May?

Brenda

Brenda McCorquodale

Regional Manager, Aquaculture Resource Management
Fisheries and Oceans Canada
Gestionnaire régionale des ressources, Direction des peches
Pêches et Océans Canada

1965 Island Diesel Way | Nanaimo, BC | Nanaimo, CB | V9S 5W8
Email | Courriel: Brenda.McCorquodale@dfo-mpo.gc.ca
Telephone | Téléphone: 250-754-0367

From: Mollins, Jennifer
Sent: Thursday, April 18, 2019 2:13 PM
To: McCorquodale, Brenda
Subject: REVIEW - CRWG meeting notes from April 8, 2019

Brenda, for your review. I used the same format that you used for the last meeting, and incorporated Kerra's comments.

\\Dcbcvanna01b\VAN RHQ 4\aquaculture Programs
Team\Governance\Engagement\NGO Science AMD\2019-04-08 Nanaimo

From: Taekema, Bernie John <BernieJohn.Taekema@dfo-mpo.gc.ca>
Sent: April-17-19 8:47 AM
To: Mollins, Jennifer <Jennifer.Mollins@dfo-mpo.gc.ca>
Subject: RE: CRWG meeting notes - comments due Friday

I have no comments other than I agree that they may be too specific in some cases as pointed out by Kerra.

From: Mollins, Jennifer
Sent: April-16-19 9:10 AM
To: McCorquodale, Brenda; Paylor, Adrienne; Waddington, Zac; Shaw, Kerra; Taekema, Bernie John
Subject: RE: CRWG meeting notes - comments due Friday

Hi again – reminder to send me your comments. We should share these notes by April 23, so please have comments to me by EOD Friday.

Thanks!

From: Mollins, Jennifer
Sent: April-11-19 4:24 PM
To: McCorquodale, Brenda <Brenda.McCorquodale@dfo-mpo.gc.ca>; Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>; Waddington, Zac <Zac.Waddington@dfo-mpo.gc.ca>; Shaw, Kerra <Kerra.Shaw@dfo-mpo.gc.ca>; Taekema, Bernie John <BernieJohn.Taekema@dfo-mpo.gc.ca>
Subject: RE: CRWG meeting notes

Hi all,

Here are my notes from the meeting on Tuesday. Please revise as required.

\\Dcbcvanna01b\VAN RHQ 4\aquaculture Programs
Team\Governance\Engagement\NGO Science AMD\2019-04-08 Nanaimo\draft meeting record April
8, 2019 CRWG Nanaimo.docx

Action items:

Kerra to share marine finfish production and biomass reports (measured in different ways over time)

Next meeting topics:

- Processing and hatchery effluent (invite Government of BC) (recommended by CRWG)
- Drug and pesticide use (recommended by CRWG)
- Aquaculture Act(recommended by DFO)

-----Original Appointment-----

From: McCorquodale, Brenda

Sent: April-05-19 4:54 PM

To: McCorquodale, Brenda; [REDACTED]

[REDACTED] Paylor,
Adrienne; Waddington, Zac; Shaw, Kerra; Taekema, Bernie John; Mollins, Jennifer;
[REDACTED]

Subject: CRWG - DFO AMD meeting

When: April-08-19 1:00 PM-4:00 PM (UTC-08:00) Pacific Time (US & Canada).

Where: 1965 Island Diesel Way DFO Office, Nanaimo or teleconference 1-877-413-4781 Passcode
[REDACTED]

One new participant added – April 3

Added response letter – April 5

Hello all

Please find attached a draft agenda for the meeting on Monday and the correspondence from the CRWG to DFO. We hope to have the response to you in the next day or so.

<< File: Letter to Brenda McCorquodale re 2019 mgmt.docx >> << File: Agenda DFO CRWG April 8 2019 Nanaimo DRAFT.docx >>

<< File: Scanned from a Xerox Multifunction Printer.pdf >>

s.16(2)(c)

s.19(1)

Fisheries and Oceans Canada (DFO)
Conservation Regulatory Working Group (CRWG)
Meeting April 8, 2019
DFO boardroom, 1965 Island Diesel Way, Nanaimo

Materials Distributed:

- Letter from Living Oceans to DFO, February 12, 2019
- Response letter from DFO, April 5, 2019

Participants:

Fisheries and Oceans Canada:

Adrienne Paylor, Manager, Aquaculture Environmental Operations
Zac Waddington, Lead Veterinarian, Aquaculture Environmental Operations
Kerra Shaw, Senior Biologist, Aquaculture Environmental Operations
Brenda McCorquodale, Manager, Aquaculture Resource Management
Bernie Taekema, Senior Coordinator, Aquaculture Resource Management
Jennifer Mollins, Senior Coordinator, Aquaculture Resource Management

Conservation Regulatory Working Group:

[Redacted] Living Oceans Society
[Redacted] Watershed Watch Salmon Society
[Redacted] Suzuki Foundation
[Redacted] Tides Canada
[Redacted] Georgia Strait Alliance
[Redacted] Wild Salmon Forever

Record of Discussion

The meeting started off with a general discussion about the history of DFO and the Conservation Regulatory Working Group, including discussions related to the development of a Terms of Reference for the Marine Finfish Aquaculture Management Advisory Committee (AMAC). This committee has been on hiatus since 2016. CRWG members indicated they are interested in continuing bi-lateral meetings with DFO on aquaculture management, and are also open to participating in meetings occasionally with First Nations and/or industry.

Sea lice management

DFO reviewed situation with sea lice management in Clayoquot Sound which led to challenges in 2018. Measures are being taken by industry to avoid a recurrence, such as

- employing a hydrolicer that removes lice, which are then captured and incinerated on a barge. This technology was available in 2018.
- Juvenile salmon are now being treated with Invicta at the hatchery, which prevents sea lice from forming on the salmon for up to 9 months.



Fisheries and Oceans
Canada

Pêches et Océans
Canada

s.19(1)



Peroxide treatments that were planned by industry and approved by DFO were delayed due to public concern and BC consultations process, and a well-boat wasn't available in a timely manner.

CWRG indicated concern that the Bear Bluff facility is over the threshold, and there may be an issue with sea lice again this year. DFO responded that harvesting was completed at that site on April 1.

DFO indicated that the sea lice occurrence at Clayoquot may be studied to help determine the population-level impacts of sea lice on salmon by studying the returning stocks to that area. DFO has hired an epidemiologist, who will assess trends of sea lice and pathogens. This can be looked at alongside wild stock population information.

DFO is moving to an area based management approach, employing models to assess hydro-connectivity of farms that could transfer sea lice. DFO's FVCOM model, among other tools, is being used. This information will help to create improved marine finfish aquaculture licence conditions for the 2022, possibly including more performance based conditions.

CRWG members were concerned with DFO's sea lice approach, and urged DFO to be more conservative. CRWG members stated that lower lice levels will protect wild fish, and stated that mechanical and peroxide treatments will more effective at lower lice loads. CRWG members stated that drugs should be used sparingly to avoid drug resistance. Treating at commencement of smolt migration would result in better wild salmon protection and is preferred by the CRWG.

CRWG members asked if the lice threshold is under review. There was a discussion about female adult lice thresholds as an alternative to motile lice levels.

CRWG members asked how DFO manages Caligus. DFO indicated that do not intend to control for Caligus sea lice as they have not been demonstrated to be problematic and are typically quite temporal in nature. CRWG expressed concern about Caligus lice impacting herring and salmon. DFO noted that records are kept on levels of this species, but industry is not required to manage these levels.

CRWG is concerned that DFO is using scientific uncertainty to delay decisions that protect wild salmon from aquaculture. CRWG referenced the following paper and suggested DFO review: <http://policyoptions.irpp.org/magazines/april-2018/integrity-of-the-dfos-science-advisory-process-in-question/>

There was a discussion about what the requirement would be to change the aquaculture licence conditions prior to 2022, and what level of harm would meet the bar for 'conservation

concerns'. DFO notes that Science 'bulletins' may also be used issued to clarify licence requirements within the current licencing period.

DFO is working with First Nations to identify on-site monitoring and potentially regulatory role.

CRWG indicated that audits should be unannounced, where possible, to make them effective, citing a paper which found small differences in reports from industry when DFO was present for audits.

Peak biomass

There was a discussion about peak biomass as opposed to production limits. DFO confirmed that it manages for peak biomass at a site, and acknowledged that peak biomass could be sustained for some period time as fish are harvested and others within the pen continue to grow. DFO noted that if a second peak is reached, monitoring is again required. If benthic baseline conditions are not met, the farm cannot restock until the site recovers. DFO also noted that there are random audits done on benthic impacts which do not statistically differ from information submitted by industry. CRWG asked for more detailed information related to benthic performance results.

Action: DFO (Kerra) and CRWG () to discuss further options for sharing benthic information more detailed than what is on the public reporting website.

Enforcement

- The CRWG members requested additional information on enforcement including what is being audited, where are enforcement efforts being targeted and what is being found.

Next steps

CRWG indicated interest in meeting again soon to discuss further topics, as feel this meeting was productive. Next meeting topics:

- Processing and hatchery effluent (invite Government of BC) (recommended by CRWG)
- Drug and pesticide use (recommended by CRWG)
- Aquaculture Act(recommended by DFO)

CRWG noted that they want to be involved early in policy development, rather than commenting on a draft of the Act that has already been written.

DFO to do up minutes and organize another meeting.

Facility Reference Number	Licence Holder	Site Common Name	Latitude	Longitude	Fish Health Zone	Number of Counts Performed	monthly farm abundance male	monthly farm abundance females	monthly farm abundance chalcimus	monthly farm abundance Caligus	English Comments	French Comments	year class	entry date	age	Internal Comments
1537	Cermaq Canada	Bare Bluff	49.32702	-125.79902	2.3	2	0.08	0.01	0.15	0.07						
227	Cermaq Canada	Bawden	49.30798	-126.00721	2.3		9.51	5.98	0.36	0.39						moved to March, (7 98), 18 Mar 1-Apr (10 71);
520	Cermaq Canada	Bedwell	49.26548	-125.81247	2.3	2	0.59	0.18	0.37	0.15						
234	Cermaq Canada	Dixon Bay	49.40478	-126.15072	2.3	2	9.08	4.58	0.01	0.00	Harvesting	Récolte				
540	Cermaq Canada	Fortune Channel	49.23503	-125.75174	2.3	0					Recent seawater entry	Entrée d'eau de mer récente				
1507	Cermaq Canada	Millar Channel	49.37622	-126.09003	2.3	3	23.44	7.00	2.63	0.59	Harvesting	Récolte				
543	Cermaq Canada	Mussel Rock	49.25925	-125.86762	2.3	2	1.75	1.02	0.06	0.17	Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis				
6668	Cermaq Canada	Plover Point	49.21433	-125.76693	2.3	2	0.44	0.27	0.02	0.09						
526	Cermaq Canada	Rant Point	49.2567	-125.84153	2.3	3	2.16	1.24	0.11	0.19						
314	Cermaq Canada	Ross Pass	49.32437	-126.04849	2.3	2	15.14	9.01	3.77	0.10	Harvesting	Récolte				
527	Cermaq Canada	Saranac Island	49.24803	-125.90671	2.3	3	3.60	1.36	0.35	0.66	Harvesting	Récolte				single pen 2-Apr moved to 1-Apr (CFED 19 Mar (3 74), 2 Apr (4 22), Harvesting began in February, pen empty by
1738	Grieg Seafood BC	Atrevida	49.65603	-126.45404	2.4	2	9.34	5.68	0.04	0.01	Harvesting	Récolte				
1789	Grieg Seafood BC	Conception	49.65923	-126.47587	2.4	2	1.17	0.47	0.01	0.00						
1762	Grieg Seafood BC	Gore (post-treatment)	49.6466	-126.43167	2.4	1	0.32	0.24	0.01	0.18	Management action underway: Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	Mesure de gestion en cours au secteur; La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis				logistics around counting ve. Counting methodology acceptable given this ZW
1762	Grieg Seafood BC	Gore (pre-treatment)	49.6466	-126.43167	2.4	1	4.33	3.63	0.10	0.25	Harvesting: Management action planned	Récolte; Mesure de gestion planifiée				
1862	Grieg Seafood BC	Hecate	49.86799	-126.7573	2.4	2	0.05	0.03	0.00	0.00						
1849	Grieg Seafood BC	Muchalat North	49.64394	-126.33953	2.4	2	7.24	5.92	3.39	0.25	Harvesting: Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	Récolte; La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis				
1700	Grieg Seafood BC	Muchalat South	49.64012	-126.32735	2.4	1	2.47	1.53	0.07	0.00						Since 27-Feb, counts done 20-Mar, 21-day window but included - agree? Yes, agree-ZW

s.20(1)(b)
s.21(1)(a)
s.21(1)(b)

1079	Grieg Seafood BC	Steamer	49.8868	-126.7911	2.4	2	0.04	0.03	0.01	0.00			
144	Marine Harvest Canada	Koskimo	50.45661	-127.89988	2.4	2	0.23	0.10	2.60	0.36			
1338	Marine Harvest Canada	Mahatta East	50.4746	-127.78758	2.4	3	0.11	0.08	0.42	0.06		Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis
1237	Marine Harvest Canada	Monday Rocks	50.48588	-127.87584	2.4	1	0.07	0.04	2.40	0.10		Fallow	Mise en jachère
820	Marine Harvest Canada	Wicklow Point	50.78659	-126.69153	3.3	0							
1698	Grieg Seafood BC	Alhistrom	49.7793	-124.15395	3.1	2	0.20	0.09	0.02	0.00			
1697	Grieg Seafood BC	Culloden	49.79595	-124.10162	3.1	2	0.08	0.04	0.02	0.01			
332	Grieg Seafood BC	Salten	49.61535	-125.83407	3.1	1	0.35	0.05	0.02	0.00		Area management action underway	Mesure de gestion en cours au secteur
746	Grieg Seafood BC	Site 13	49.6291	-123.84265	3.1	1	0.20	0.03	0.00	0.00		Management action underway; Count from a full complement of 3 pens precluded by diminished stock (<4 pens)	Mesure de gestion en cours; Dénombrement de l'ensemble des trois enclos empêché par la diminution des stocks (< 4 bassins)
221	Grieg Seafood BC	Vantage	49.67226	-123.86019	3.1	1	0.87	0.24	0.03	0.00		Area management action underway	Mesure de gestion en cours au secteur
303	Marine Harvest Canada	Glacial Creek	50.01008	-123.90241	3.1	0							Géniteurs à l'année du frai
1401	Cermaq Canada	Brent Island	50.28613	-125.34917	3.2	2	0.14	0.05	0.00	4.00			
304	Cermaq Canada	Raza Island	50.32159	-125.00882	3.2	3	0.33	0.06	1.23	2.05			
306	Cermaq Canada	Venture Point	50.30241	-125.33778	3.2	2	0.11	0.11	0.37	0.72			
871	Grieg Seafood BC	Barnes Bay	50.32437	-125.26039	3.2	2	0.06	0.02	0.12	0.87			
1300	Marine Harvest Canada	Athorpe	50.47531	-125.80975	3.2	0						Fallow	Mise en jachère
211	Marine Harvest Canada	Okisollo	50.30946	-125.31618	3.2	4	0.06	0.04	0.69	0.31		Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis
1136	Marine Harvest Canada	Shaw Point	50.48527	-125.86931	3.2	1	0.12	0.02	0.32	0.45		Recent seawater entry	Entrée d'eau de mer récente
1144	Cermaq Canada	Burdwood	50.7969	-126.49581	3.3	0							
458	Cermaq Canada	Cypress Harbour	50.83772	-126.66313	3.3	1	0.33	0.14	0.32	0.07			
728	Cermaq Canada	Sir Edmund Bay	50.83096	-126.59684	3.3	2	0.07	0.00	0.14	0.24			
1825	Grieg Seafood BC	Noo-la	50.60799	-126.36301	3.3	0						Recent seawater entry	Entrée d'eau de mer récente
821	Marine Harvest Canada	Glacier Falls	50.84785	-126.31921	3.3	1	0.34	0.15	0.15	0.07			
1618	Marine Harvest Canada	Humphrey Rock	50.69682	-126.25532	3.3	2	0.16	0.03	0.01	0.00			
143	Marine Harvest Canada	Larsen Island	50.60175	-126.63284	3.3		0.28	0.06	0.75	0.08		Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis
467	Marine Harvest Canada	Midsummer	50.65784	-126.66298	3.3	1	0.65	0.15	0.00	0.00			
141	Marine Harvest Canada	Port Elizabeth	50.67099	-126.47653	3.3		0.13	0.07	0.30	0.26		Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis
1145	Marine Harvest Canada	Portt Bay	50.6492	-126.6182	3.3	1						Fallow	Mise en jachère
1059	Marine Harvest Canada	Sargeant Pass	50.67346	-126.18595	3.3		0.48	0.22	0.18	0.02			
465	Marine Harvest Canada	Swanson	50.61871	-126.70473	3.3	0						Recent seawater entry	Entrée d'eau de mer récente

892	Marine Harvest Canada	Bell Island	50.83242	-127.52057	3.4	2	0.20	0.04	0.07	0.07	0.02	Management action underway	Mesure de gestion en cours	
1288	Marine Harvest Canada	Doyle Island	50.81456	-127.48698	3.4	1	0.09	0.03	0.22	0.22	0.02			
7053	Marine Harvest Canada	Ghiya	50.90078	-127.98638	3.4	4	0.17	0.06	0.25	0.06		Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis	
1350	Marine Harvest Canada	Shelter Bay	50.96555	-127.45345	3.4	5	0.96	0.36	0.10	0.22				
831	Marine Harvest Canada	Shelter Pass	50.88414	-127.5004	3.4	5	0.07	0.01	0.06	0.03		Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis	
7054	Marine Harvest Canada	Wanx tails	50.88322	-127.89568	3.4	4	0.03	0.00	0.05	0.00		Survey methodology differs from sampling design outlined in licence conditions, but meets or exceeds the requirement	La méthodologie du relevé peut différer de la conception de l'échantillonnage mentionnée dans les conditions de permis	
7714	Marine Harvest Canada	Alexander (post-treatment)	52.67648	-128.57494	3.5	1	0.21	0.15	0.02	0.01		Management action underway	Mesure de gestion en cours	
7714	Marine Harvest Canada	Alexander (pre-treatment)	52.67648	-128.57494	3.5	2	2.74	1.69	0.19	0.12		Management action planned	Mesure de gestion planifiée	
1702	Marine Harvest Canada	Goat Cove (post-treatment)	52.78726	-128.4199	3.5	1	0.07	0.04	0.14	0.14		Management action underway	Mesure de gestion en cours	
1702	Marine Harvest Canada	Goat Cove (pre-treatment)	52.78726	-128.4199	3.5	1	1.05	0.51	0.10	0.58		Management action planned	Mesure de gestion planifiée	
1691	Marine Harvest Canada	Kid Bay	52.80048	-128.40111	3.5	3	0.25	0.03	0.58	0.41		Management action underway	Mesure de gestion en cours	

s.20(1)(b)

Facility Reference Number	Licence holder	Site Common Name	Latitude	Longitude	Fish Health Zone	Management Zone	Number of Counts Performed	monthly farm abundance male	monthly farm abundance female	monthly farm abundance chlamydia	monthly farm abundance ophiura	English Comments	French Comments	year class	entry date	age
1537	Cermaq Canada	Bare Bluff	49.32702	-125.79902	2.3		1	9.60	1.41	1.99	0.04	Harvesting; Count(s) not required (harvesting)	Récolte; Dénombrement(s) non requis (récolte)			
520	Cermaq Canada	Bedwell	49.26548	-125.81247	2.3		2	4.28	0.79	1.71	0.00	Harvesting	Récolte			
1401	Cermaq Canada	Brent Island	50.28613	-125.34917	3.2							Fallow	Mise en jachère			
1144	Cermaq Canada	Burdwood	50.7969	-126.49581	3.3		3	1.54	0.70	0.90	2.41	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même			
458	Cermaq Canada	Cypress Harbour	50.83772	-126.66313	3.3		2	0.75	0.63	0.93	1.53					
234	Cermaq Canada	Dixon Bay	49.40478	-126.15072	2.3		2	0.01	0.00	0.03	0.06	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même			
869	Cermaq Canada	Maude Island	50.85271	-126.75743	3.3		2	0.46	0.21	0.16	2.46					2nd count 2 pens (probably early)
1507	Cermaq Canada	Millar Channel	49.37622	-126.09003	2.3		3	0.02	0.00	4.81	0.21	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même			
543	Cermaq Canada	Mussel Rock	49.25925	-125.86762	2.3		1	0.00	0.00	0.00	0.01	Count(s) not performed (health management action)	Dénombrement(s) non effectués (mesure de gestion de la santé)			
6668	Cermaq Canada	Plover Point	49.21433	-125.76693	2.3		3	4.89	2.21	0.06	0.05	Bath Treatment	Traitement dans un bain			
304	Cermaq Canada	Raza Island	50.32159	-125.00882	3.2		3	1.24	0.74	0.29	0.09					
314	Cermaq Canada	Ross Pass	49.32437	-126.04849	2.3		2	0.02	0.00	0.00	0.01					
527	Cermaq Canada	Sarniac Island	49.24803	-125.90671	2.3		1	0.00	0.00	0.00	0.00	Sampling methodology does not meet requirements outlined in licence conditions (<4 pens)	La méthodologie d'échantillonnage ne répond pas aux exigences mentionnées dans les conditions de permis (< 4 bassins)			
1336	Cermaq Canada	Simmonds Point	50.87791	-126.90153	3.4		0					Count(s) not required (<4 pens)	Dénombrement(s) non requis (< 4 bassins)			
728	Cermaq Canada	Sir Edmund Bay	50.85096	-126.59684	3.3		3	1.29	0.75	0.07	1.00	Count(s) not required (harvesting)	Dénombrement(s) non requis (récolte)			
871	Grieg Seafood BC	Barnes Bay	50.32437	-125.26039	3.2		0									
1789	Grieg Seafood BC	Conception	49.65923	-126.47587	2.4		2	0.03	0.02	0.02	0.28					
1697	Grieg Seafood BC	Culloden	49.79595	-124.10162	3.1		1	0.07	0.00	0.13	0.15	Sampling methodology does not meet requirements outlined in licence conditions (<4 pens)	La méthodologie d'échantillonnage ne répond pas aux exigences mentionnées dans les conditions de permis (< 4 bassins)			
1863	Grieg Seafood BC	Esperanza	49.87814	-126.76145	2.4		2	7.74	3.93	0.00	0.00	Harvesting; Management action planned (Bath Treatment)	Récolte; Mesure de gestion planifiée (Traitement dans un bain)			
1762	Grieg Seafood BC	Gore	49.5466	-126.43167	2.4		2	0.08	0.03	0.07	0.00					
1862	Grieg Seafood BC	Heate	49.85799	-126.75723	2.4		2	0.80	0.40	0.01	0.01					
1849	Grieg Seafood BC	Muchalat North	49.64394	-126.35953	2.4		2	0.03	0.00	0.02	0.03					
1825	Grieg Seafood BC	Noo-la	50.60799	-126.36301	3.3		2	0.45	0.19	0.04	2.50					
332	Grieg Seafood BC	Salten	49.61535	-123.83407	3.1		0					Count(s) not required (<4 pens)	Dénombrement(s) non requis (<4 bassins)			
746	Grieg Seafood BC	Site 13	49.6291	-123.84265	3.1		0					Count(s) not required (<4 pens)	Dénombrement(s) non requis (<4 bassins)			
1079	Grieg Seafood BC	Steamer - post treatment	49.8868	-126.7911	2.4		1	0.30	0.27	0.00	0.00					
1079	Grieg Seafood BC	Steamer - pre-treatment	49.8868	-126.7911	2.4		1	4.33	1.75	0.52	0.00	Bath Treatment	Traitement dans un bain			
7273	Grieg Seafood BC	Tsa-ya	50.61225	-126.33212	3.3		2	0.48	0.23	0.25	5.53					
221	Grieg Seafood BC	Vantage	49.67226	-123.86019	3.1		0					Count(s) not required (<4 pens)	Dénombrement(s) non requis (<4 bassins)			

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1839	Grieg Seafood BC	Waikua	50.60106	-126.34741	3.3		2	0.30	0.16	0.78	5.57		
1705	Grieg Seafood BC	Williamson	49.65623	-126.42849	2.4		2	0.02	0.00	0.01	0.00		
7714	Marine Harvest Canada	Alexander	52.67648	-128.57494	3.5		3	0.05	0.00	0.42	0.06		
1300	Marine Harvest Canada	Althorpe	50.47531	-125.80975	3.2		3	2.99	0.84	1.35	1.11	In-feed Treatment; Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	Traitement administré dans l'alimentation; La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même
892	Marine Harvest Canada	Bell Island	50.83242	-127.52057	3.4		4	0.44	0.15	0.31	0.13	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même
790	Marine Harvest Canada	Chancellor Channel	50.41723	-125.66284	3.2		4	0.19	0.10	0.32	0.00	In-feed Treatment; Count(s) not required (<21 days post in-feed treatment)	Traitement administré dans l'alimentation; Dénombrement(s) non requis (<21 jours après le traitement dans l'alimentation)
1586	Marine Harvest Canada	Doctor Islets	50.63373	-126.28925	3.3		1	0.18	0.08	0.13	0.08	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même
1288	Marine Harvest Canada	Doyfe Island	50.81456	-127.48698	3.4		4	0.46	0.12	0.10	0.02		
1293	Marine Harvest Canada	Duncan Island	50.8195	-127.55568	3.4		4	0.37	0.23	0.02	0.19		
7053	Marine Harvest Canada	Ghi ya	50.90078	-127.93638	3.4		4	0.07	0.00	0.26	0.02		
703	Marine Harvest Canada	Glacial Creek	50.01008	-123.90241	3.1		1	0.88	0.25	0.35	0.02	Fallow	Mise en jachère
1702	Marine Harvest Canada	Goat Cove	52.78726	-128.4199	3.5		0					Management action planned (in-feed treatment)	Mesure de gestion planifiée (Traitement administré dans l'alimentation)
1581	Marine Harvest Canada	Hardwicke - post-treatment	50.41339	-125.76974	3.2		5.00	3.06	1.34	1.60	0.90	Mechanical Removal Treatment	Traitement par retrait mécanique
1581	Marine Harvest Canada	Hardwicke - pre-treatment	50.41339	-125.76974	3.2		1	7.94	3.60	2.30	0.97		
1691	Marine Harvest Canada	Kid Bay	52.80048	-128.40111	3.5		4	0.61	0.21	0.55	0.34	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même
144	Marine Harvest Canada	Koskimo	50.45861	-127.89988	2.4		4	0.52	0.12	2.18	0.93	Count(s) not required (<4 pens)	Dénombrement(s) non requis (<4 bassins)
143	Marine Harvest Canada	Larsen Island	50.60175	-126.63284	3.3		0					Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même
100	Marine Harvest Canada	Lees Bay	50.41063	-125.70029	3.2		4	0.28	0.11	0.00	0.00	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même
1238	Marine Harvest Canada	Mahatta West	50.469	-127.83538	2.4		5	0.18	0.07	1.73	1.30	Fallow	Mise en jachère
1351	Marine Harvest Canada	Marsh Bay	50.90567	-127.34239	3.4		0					Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même
1237	Marine Harvest Canada	Monday Rocks	50.48588	-127.87584	2.4		4	0.54	0.19	5.43	2.51		

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78	Marine Harvest Canada	Phillips Arm	50.48825	-125.35658	3.2		4	0.20	0.10	0.02	0.02	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même	4 counts, 1st 3rd 2 pens
141	Marine Harvest Canada	Port Elizabeth	50.67099	-126.47653	3.3		2	0.87	0.48	1.55	1.37	In-feed Treatment: Count(s) not required (<21 days post in-feed treatment)	Traitement administré dans l'alimentation; Dénombrement(s) non requis (<21 jours après le traitement dans l'alimentation)	2nd 3rd counts not SUEL, count 2 pens
1198	Marine Harvest Canada	Raynor	50.89253	-127.25359	3.4		4	0.14	0.08	0.42	0.18	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même	4 counts, 1st 2 pens
1382	Marine Harvest Canada	Robertson	50.93155	-127.42258	3.4		1	0.35	0.28	0.17	0.07	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même	Single count, no explanation
1059	Marine Harvest Canada	Sargeaunt Pass	50.67346	-126.18595	3.3		5	0.04	0.00	0.25	0.15	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même	
1136	Marine Harvest Canada	Shaw Point - post-treatment	50.48527	-125.89891	3.2		2	1.90	1.24	0.28	0.86	Bath Treatment	Traitement dans un bain	
1136	Marine Harvest Canada	Shaw Point - pre-treatment	50.48527	-125.89891	3.2		1	5.73	3.70	0.14	1.98	Sampling methodology does not meet requirements outlined in licence conditions (<4 pens)	La méthodologie d'échantillonnage ne répond pas aux exigences mentionnées dans les conditions de permis (< 4 bassins)	count of 2 pens
1350	Marine Harvest Canada	Shelter Bay	50.96555	-127.45345	3.4		1	0.03	0.00	0.45	0.00	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même	
831	Marine Harvest Canada	Shelter Pass	50.88414	-127.5004	3.4		5	0.77	0.20	1.22	0.30	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	Traitement administré dans l'alimentation; Dénombrement(s) non requis (<21 jours après le traitement dans l'alimentation)	
380	Marine Harvest Canada	Sonora Point	50.42362	-125.30517	3.2		4	0.36	0.21	0.00	0.07	In-feed Treatment: Count(s) not required (<21 days post in-feed treatment)	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même	
465	Marine Harvest Canada	Swanson	50.61871	-126.70473	3.3		2	0.28	0.09	0.75	0.30	Sampling methodology differs from requirements outlined in licence conditions, but meets or exceeds the requirement	La méthodologie d'échantillonnage diffère des exigences mentionnées dans les conditions de permis, mais répond aux exigences, les dépasse même	
820	Marine Harvest Canada	Wicklow Point	50.78659	-126.69153	3.3		4	0.73	0.21	1.73	0.46			

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Conducting bioassays for Si/CF application, possible peroxide treatment planned

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Facility Reference No	Facility Name	Sampling Does This Month	If no Sampling, Explain	Sampling Event Start Date	Pen ID	Reference Pen	entry date	Pen Sample Date	Number of Fish Sampled	Sampling Method	Adult Females L. salmonis	Meiotic L. salmonis	Chilinus	Meiotic Chilinus	Action Taken	Start Date (if R or PC approval)	Comments	form_perfi an	mont_perfi an	cha_perfi an	col_perfi an
78	Phillips Arm, Cardero Channel	Y		07-Jan-19	0001	Y		07-Jan-19	20	Box seine	30	49	35	14	Treatment pending			1.50	2.45	1.75	0.70
78	Phillips Arm, Cardero Channel	Y		07-Jan-19	0006	N		08-Jan-19	20	Box seine	41	78	18	18	Treatment pending			0.45	0.75	0.70	0.90
78	Phillips Arm, Cardero Channel	Y		13-Jan-19	0001	Y		13-Jan-19	20	Box seine	41	78	0	0	Treatment pending			2.05	3.90	0.00	0.00
78	Phillips Arm, Cardero Channel	Y		13-Jan-19	0007	N		14-Jan-19	20	Box seine	17	52	0	17	Treatment pending			0.85	2.60	0.00	0.85
78	Phillips Arm, Cardero Channel	Y		13-Jan-19	0008	N		15-Jan-19	20	Box seine	15	35	0	16	Treatment pending			0.75	1.75	0.00	0.80
78	Phillips Arm, Cardero Channel	Y		20-Jan-19	0001	Y		20-Jan-19	20	Box seine	38	73	11	37	Treatment ongoing	21-Jan-19	SUCE	1.90	3.65	0.55	1.85
78	Phillips Arm, Cardero Channel	Y		20-Jan-19	0004	N		20-Jan-19	20	Box seine	13	24	3	39	Treatment ongoing	21-Jan-19		0.65	1.20	0.15	1.95
78	Phillips Arm, Cardero Channel	Y		20-Jan-19	0005	N		20-Jan-19	20	Box seine	31	65	13	4	Treatment ongoing	21-Jan-19	SUCE	1.55	3.25	0.65	0.20
78	Phillips Arm, Cardero Channel	Y		30-Jan-19	0001	Y		30-Jan-19	20	Box seine	34	65	41	11	None required			0.80	2.00	1.70	0.25
78	Phillips Arm, Cardero Channel	Y		10-Jan-19	0004	N		10-Jan-19	20	Box seine	16	40	34	5	None required			0.75	1.65	0.75	0.25
100	Lees Bay, N. Shore, West Thurlow Is.	Y		10-Jan-19	L801	N		10-Jan-19	20	Box seine	15	39	15	5	None required			0.65	2.30	0.00	0.00
100	Lees Bay, N. Shore, West Thurlow Is.	Y		10-Jan-19	L802	Y		10-Jan-19	20	Box seine	13	46	4	0	None required			0.50	1.20	0.20	0.00
100	Lees Bay, N. Shore, West Thurlow Is.	Y		10-Jan-19	L803	N		10-Jan-19	20	Box seine	10	24	4	0	None required			0.70	1.25	0.00	0.00
100	Lees Bay, N. Shore, West Thurlow Is.	Y		17-Jan-19	L801	N		17-Jan-19	20	Box seine	14	25	0	0	None required			0.35	0.95	0.00	0.00
100	Lees Bay, N. Shore, West Thurlow Is.	Y		17-Jan-19	L802	Y		17-Jan-19	20	Box seine	7	19	0	0	None required			0.40	0.45	0.00	0.00
100	Lees Bay, N. Shore, West Thurlow Is.	Y		24-Jan-19	L801	N		24-Jan-19	20	Box seine	8	9	0	0	None required			0.45	0.55	0.00	0.00
100	Lees Bay, N. Shore, West Thurlow Is.	Y		24-Jan-19	L802	Y		24-Jan-19	20	Box seine	9	11	0	0	None required			0.45	0.55	0.00	0.00
100	Lees Bay, N. Shore, West Thurlow Is.	Y		24-Jan-19	L803	N		24-Jan-19	20	Box seine	9	11	0	0	None required			0.40	0.65	0.00	0.00
100	Lees Bay, N. Shore, West Thurlow Is.	Y		31-Jan-19	L802	Y		31-Jan-19	20	Box seine	8	13	0	0	None required			0.20	0.45	0.00	0.00
100	Lees Bay, N. Shore, West Thurlow Is.	Y		31-Jan-19	L805	N		31-Jan-19	20	Box seine	4	9	0	0	None required			0.20	0.45	0.00	0.00
136	Cliff Bay Simoom Sound Wishart Peninsula	N	Fallow																		
138	Dunsterville Bay, Hoshon Channel	N	Fallow																		
141	Port Elizabeth, Gifford Island	Y		07-Jan-19	PE02	Y		07-Jan-19	20	Box seine	9	10	79	38	None required			0.45	0.50	0.35	0.90
141	Port Elizabeth, Gifford Island	Y		07-Jan-19	PE08	N		07-Jan-19	20	Box seine	5	6	47	38	None required			0.25	0.30	2.35	0.90
141	Port Elizabeth, Gifford Island	Y		13-Jan-19	PE02	Y		13-Jan-19	20	Box seine	9	18	95	30	None required			0.45	0.90	4.75	1.50
141	Port Elizabeth, Gifford Island	Y		13-Jan-19	PE09	N		14-Jan-19	20	Box seine	12	23	63	76	None required			0.60	1.15	3.15	3.80
141	Port Elizabeth, Gifford Island	Y		13-Jan-19	PE10	N		15-Jan-19	20	Box seine	10	13	31	76	None required			0.50	0.65	1.55	3.80
141	Port Elizabeth, Gifford Island	Y		19-Jan-19	PE02	Y		19-Jan-19	20	Box seine	5	11	121	31	None required			0.25	0.35	6.05	1.55
141	Port Elizabeth, Gifford Island	Y		19-Jan-19	PE06	N		19-Jan-19	20	Box seine	4	7	32	16	None required			0.20	0.35	1.60	0.80
141	Port Elizabeth, Gifford Island	Y		26-Jan-19	PE02	Y		26-Jan-19	20	Box seine	18	36	142	35	None required			0.90	2.80	7.10	1.75
141	Port Elizabeth, Gifford Island	Y		26-Jan-19	PE03	N		29-Jan-19	20	Box seine	7	9	53	62	None required			0.55	0.45	2.65	3.10
141	Port Elizabeth, Gifford Island	Y		26-Jan-19	PE04	N		29-Jan-19	20	Box seine	9	13	27	45	None required			0.45	0.65	1.35	2.30
143	Larsen Island, Indian Channel	N	Fallow																		
143	Kosimo Bay, Quatsino Sound	Y		05-Jan-19	K003	Y		05-Jan-19	20	Box seine	0	0	5	4	None required			0.00	0.00	0.25	0.30
144	Kosimo Bay, Quatsino Sound	Y		05-Jan-19	K010	N		05-Jan-19	20	Box seine	1	2	13	1	None required			0.05	0.10	0.65	0.05
144	Kosimo Bay, Quatsino Sound	Y		05-Jan-19	K011	N		05-Jan-19	20	Box seine	0	3	12	1	None required			0.00	0.15	0.80	0.05
144	Kosimo Bay, Quatsino Sound	Y		12-Jan-19	K006	N		12-Jan-19	20	Box seine	0	1	6	3	None required			0.00	0.35	0.90	0.10
144	Kosimo Bay, Quatsino Sound	Y		12-Jan-19	K006	N		12-Jan-19	20	Box seine	0	2	9	2	None required			0.00	0.10	0.45	0.10
144	Kosimo Bay, Quatsino Sound	Y		19-Jan-19	K003	Y		19-Jan-19	20	Box seine	0	2	6	0	None required			0.00	0.10	0.30	0.00
144	Kosimo Bay, Quatsino Sound	Y		19-Jan-19	K008	N		19-Jan-19	20	Box seine	0	2	10	10	None required			0.00	0.00	1.05	0.50
144	Kosimo Bay, Quatsino Sound	Y		19-Jan-19	K009	N		19-Jan-19	30	Box seine	0	2	10	9	None required			0.00	0.00	0.53	0.30
169	Bariley, San Mateo Bay, Berkeley Dist.	N	Fallow																		
211	Sonora Island, Obedato Channel	N	Fallow																		
221	Vantage Point, Serhent Inlet	N	Fallow																		
234	Dixon Point, Shelter Inlet	Y		02-Jan-19	101	Y		02-Jan-19	20	Full seine	0	0	0	1	None required			0.00	0.00	0.00	0.05
234	Dixon Point, Shelter Inlet	Y		05-Jan-19	108	N		05-Jan-19	20	Full seine	0	0	0	0	None required			0.00	0.00	0.00	0.00
234	Dixon Point, Shelter Inlet	Y		05-Jan-19	108	N		05-Jan-19	20	Full seine	3	5	0	0	None required			0.15	0.25	0.00	0.00
303	Gifford Creek, near Jervis Inlet	Y		23-Jan-19	GC11	N		23-Jan-19	20	Full seine	3	5	0	0	None required			0.05	0.35	0.00	0.00
303	Gifford Creek, near Jervis Inlet	Y		23-Jan-19	GC12	N		23-Jan-19	20	Full seine	1	7	0	0	None required			0.10	0.30	0.00	0.00
303	Gifford Creek, near Jervis Inlet	Y		23-Jan-19	GC14	N		23-Jan-19	20	Full seine	2	6	0	0	None required			0.25	1.30	0.00	0.60
304	Ross Island, Ross Passage	Y		19-Jan-19	109	Y		19-Jan-19	20	Full seine	26	35	0	12	None required			1.80	3.75	0.00	0.00
304	Ross Island, Ross Passage	Y		20-Jan-19	102	N		20-Jan-19	20	Full seine	26	35	0	0	None required			1.30	3.25	0.00	0.00
304	Ross Island, Ross Passage	Y		20-Jan-19	104	N		20-Jan-19	20	Full seine	22	27	1	6	None required			1.10	1.35	0.05	0.30
306	Venture Point, Sonora Island	N	Fallow																		
314	Ross Pass, Northwest Mckay Island	Y		19-Jan-19	101	Y		19-Jan-19	20	Full seine	0	0	0	0	None required			0.00	0.00	0.00	0.00
214	Ross Pass, Northwest Mckay Island	Y		20-Jan-19	105	N		20-Jan-19	20	Full seine	0	0	0	0	None required			0.00	0.00	0.00	0.00
214	Ross Pass, Northwest Mckay Island	Y		20-Jan-19	103	N		20-Jan-19	20	Full seine	0	0	0	0	None required			0.00	0.00	0.00	0.00
377	Bickley Bay, East Thurlow Island	N	Fallow																		
378	Thurston Point South, Nodales Channel	N	Fallow																		
380	Sonora Pt., Nodales Channel	Y		01-Jan-19	SP02	Y		01-Jan-19	20	Box seine	48	65	3	0	Treatment pending			2.40	3.25	0.15	0.00
380	Sonora Pt., Nodales Channel	Y		01-Jan-19	SP09	N		01-Jan-19	20	Box seine	48	85	5	17	Treatment pending			2.40	4.25	0.25	0.85
380	Sonora Pt., Nodales Channel	Y		07-Jan-19	SP02	Y		07-Jan-19	20	Box seine	43	76	9	19	Treatment pending			2.15	3.80	0.45	0.95
380	Sonora Pt., Nodales Channel	Y		07-Jan-19	SP10	N		07-Jan-19	20	Box seine	30	46	17	15	Treatment pending			1.50	2.10	0.85	0.75
380	Sonora Pt., Nodales Channel	Y		07-Jan-19	SP04	N		09-Jan-19	20	Box seine	29	47	29	11	Treatment pending			1.45	2.35	1.45	0.55
380	Sonora Pt., Nodales Channel	Y		15-Jan-19	SP01	N		15-Jan-19	20	Box seine	32	150	6	0	Treatment pending			4.60	7.50	0.30	0.00

Facility Reference No	Facility Name	Sampling Done This Month	If No Sampling, Explain	Sampling Event Start Date	Pen ID	Reference Pen	entry date	Pen Sample Date	Number of Fish Sampled	Sampling Method	Adult Females L. salmonis	Mottie L. salmonis	Challus	Mottie Caligus	Action Taken	Start Date (If Rx or PC approval)	Comments	Items Pen ID	mol_pen ID	cal_pen ID	sh	ah
380	Sonora Pt., Nodules Channel	Y		15-Jan-19	SP02	Y		15-Jan-19	20	Box seine	56	89	3	0	Treatment pending			2.80	4.45	0.15	0.00	
380	Sonora Pt., Nodules Channel	Y		21-Jan-19	SP02	Y		21-Jan-19	20	Box seine	51	98	5	11	Treatment ongoing	21-Jan-19		2.55	4.90	0.25	0.55	
380	Sonora Pt., Nodules Channel	Y		21-Jan-19	SP05	N		21-Jan-19	20	Box seine	66	105	9	36	Treatment ongoing	21-Jan-19	SUCE	3.30	5.25	0.45	1.80	
380	Sonora Pt., Nodules Channel	Y		30-Jan-19	SP07	N		30-Jan-19	20	Box seine	42	79	8	14	Treatment ongoing	21-Jan-19		2.10	3.95	0.40	0.70	
380	Sonora Pt., Nodules Channel	Y		30-Jan-19	SP02	Y		30-Jan-19	20	Box seine	67	93	28	15	None required			3.35	4.65	1.40	0.75	
380	Sonora Pt., Nodules Channel	Y		30-Jan-19	SP05	N		30-Jan-19	20	Box seine	57	87	18	12	None required			2.85	4.35	0.50	0.60	
380	Sonora Pt., Nodules Channel	Y		30-Jan-19	SP07	N		30-Jan-19	20	Box seine	46	86	7	26	None required			2.30	4.30	0.35	1.30	
388	Broughton Point, East Thurlow Island	N	Follow																			
458	Cypress Hbr., Harbour Pt., Suttie Channel	Y		03-Jan-19	101	Y		03-Jan-19	20	Full seine	3	3	7	23	None required			0.15	0.15	0.35	1.15	
458	Cypress Hbr., Harbour Pt., Suttie Channel	Y		11-Jan-19	102	N		11-Jan-19	20	Full seine	5	10	20	0	None required			0.25	0.50	1.00	0.00	
458	Cypress Hbr., Harbour Pt., Suttie Channel	Y		16-Jan-19	106	N		16-Jan-19	20	Full seine	9	16	11	2	None required			0.45	0.80	0.55	0.10	
465	Swanton Island, North side	Y		01-Jan-19	SW01	Y		01-Jan-19	20	Box seine	7	14	19	7	Treatment pending			0.35	0.70	0.95	0.35	
465	Swanton Island, North side	Y		01-Jan-19	SW11	N		01-Jan-19	20	Box seine	12	23	30	6	Treatment pending			0.60	1.15	1.50	0.30	
465	Swanton Island, North side	Y		05-Jan-19	SW07	N		05-Jan-19	20	Box seine	5	10	52	8	Treatment pending			0.25	0.50	2.60	0.40	
465	Swanton Island, North side	Y		05-Jan-19	SW08	N		05-Jan-19	20	Box seine	7	14	48	3	Treatment pending			0.85	0.70	2.40	0.15	
465	Swanton Island, North side	Y		05-Jan-19	SW09	Y		05-Jan-19	20	Box seine	3	12	29	4	Treatment pending			0.15	0.60	1.45	0.20	
465	Swanton Island, North side	Y		14-Jan-19	SW09	Y		14-Jan-19	20	Box seine	8	12	47	3	Treatment pending			0.40	0.60	2.35	0.15	
465	Swanton Island, North side	Y		14-Jan-19	SW11	N		14-Jan-19	20	Box seine	12	24	105	3	Treatment pending			0.60	1.20	5.15	0.15	
465	Swanton Island, North side	Y		22-Jan-19	SW05	N		22-Jan-19	20	Box seine	5	20	85	3	Treatment pending			0.25	1.00	4.25	0.15	
465	Swanton Island, North side	Y		22-Jan-19	SW06	N		22-Jan-19	20	Box seine	5	12	63	2	Treatment pending			0.25	0.60	3.15	0.10	
465	Swanton Island, North side	Y		22-Jan-19	SW09	Y		22-Jan-19	20	Box seine	6	12	88	25	Treatment pending			0.30	0.60	4.40	1.25	
465	Swanton Island, North side	Y		28-Jan-19	SW09	Y		28-Jan-19	20	Box seine	14	22	100	5	Treatment pending			0.70	1.10	5.00	0.25	
465	Swanton Island, North side	Y		28-Jan-19	SW04	N		28-Jan-19	20	Box seine	10	21	146	10	Treatment pending			0.50	1.05	7.30	0.50	
466	Arrow Passage, Bonwick Island	N	Follow																			
467	Middle Island, Spring Passage	N	Follow																			
520	Bedwell, East Shore	Y		20-Jan-19	102	Y		20-Jan-19	20	Full seine	107	263	11	0	Treatment pending			5.35	13.15	0.55	0.00	
520	Bedwell, East Shore	Y		21-Jan-19	103	N		21-Jan-19	20	Full seine	46	112	25	0	Treatment pending			2.30	5.60	1.25	0.00	
540	Bedwell, East Shore	Y		22-Jan-19	104	N		22-Jan-19	20	Full seine	90	230	9	4	Treatment pending			4.50	11.50	0.45	0.20	
543	Muskel Rock, Claypoint Sound	N	Follow																			
547	Red Island, Bear Bay	N	Follow																			
553	SE Frederick Arm	N	Follow																			
706	Hasty Bay, Port Hardy	N	Follow																			
728	Sir Edmund Bay, NE Shore Broughton Inlet	Y		15-Jan-19	105	N		15-Jan-19	20	Full seine	3	4	0	0	None required			0.15	0.20	0.00	0.00	
728	Sir Edmund Bay, NE Shore Broughton Inlet	Y		16-Jan-19	105	N		16-Jan-19	20	Full seine	5	10	0	1	None required			0.25	0.30	0.00	0.05	
733	Sir Edmund Bay, NE Shore Broughton Inlet	Y		17-Jan-19	101	Y		17-Jan-19	20	Full seine	4	15	0	21	None required			0.20	0.65	0.00	0.05	
739	Cypress Hbr., Channel	N	Follow																			
743	Upper L. Suttie Passage	N	Follow																			
746	Upper L. Suttie Passage	N	Follow																			
769	Youngs Bay, Suttie Passage	N	Follow																			
790	Chancellor Channel, West Thurlow Island	Y		01-Jan-19	CC02	N		01-Jan-19	20	Box seine	30	85	7	0	None required			1.50	4.25	0.35	0.00	
790	Chancellor Channel, West Thurlow Island	Y		07-Jan-19	CC01	N		07-Jan-19	20	Box seine	11	23	1	0	None required			0.55	1.15	0.05	0.00	
790	Chancellor Channel, West Thurlow Island	Y		07-Jan-19	CC02	N		07-Jan-19	20	Box seine	26	27	1	0	None required			0.80	1.35	0.05	0.00	
790	Chancellor Channel, West Thurlow Island	Y		07-Jan-19	CC03	N		07-Jan-19	20	Box seine	39	55	2	0	None required			1.65	2.75	0.10	0.00	
790	Chancellor Channel, West Thurlow Island	Y		10-Jan-19	CC01	Y		10-Jan-19	20	Box seine	14	31	0	0	None required			0.70	1.55	0.00	0.00	
790	Chancellor Channel, West Thurlow Island	Y		10-Jan-19	CC02	N		13-Jan-19	20	Box seine	6	21	12	5	None required			0.30	1.05	0.60	0.25	
790	Chancellor Channel, West Thurlow Island	Y		21-Jan-19	CC01	N		21-Jan-19	20	Box seine	6	11	0	1	None required			0.30	0.85	0.00	0.05	
790	Chancellor Channel, West Thurlow Island	Y		21-Jan-19	CC02	N		21-Jan-19	20	Box seine	16	24	0	0	None required			0.40	1.30	0.00	0.00	
790	Chancellor Channel, West Thurlow Island	Y		21-Jan-19	CC03	N		21-Jan-19	20	Box seine	9	14	0	1	None required			0.45	0.70	0.00	0.05	
790	Chancellor Channel, West Thurlow Island	Y		28-Jan-19	CC01	Y		28-Jan-19	20	Box seine	4	5	0	0	None required			0.20	0.25	0.00	0.00	
790	Chancellor Channel, West Thurlow Island	Y		28-Jan-19	CC05	N		28-Jan-19	20	Box seine	3	7	1	1	None required			0.15	0.35	0.05	0.05	
819	Cecil Island, Greenway Sound	N	Follow																			
820	Wicklow Point, Broughton Island	Y		06-Jan-19	WP02 - pre	Y		06-Jan-19	20	Box seine	18	39	36	0	Treatment pending			0.90	1.95	1.80	0.00	
820	Wicklow Point, Broughton Island	Y		06-Jan-19	WP03 - pre	N		06-Jan-19	20	Box seine	10	20	40	1	Treatment pending			0.50	1.00	2.00	0.00	
820	Wicklow Point, Broughton Island	Y		06-Jan-19	WP04 - pre	N		06-Jan-19	20	Box seine	15	29	31	1	Treatment pending			0.75	1.45	1.55	0.05	
820	Wicklow Point, Broughton Island	Y		12-Jan-19	WP02 - pre	Y		12-Jan-19	20	Box seine	13	33	21	12	Treatment pending			0.65	1.65	1.05	0.50	
820	Wicklow Point, Broughton Island	Y		15-Jan-19	WP06 - pre	N		15-Jan-19	20	Box seine	15	48	21	7	Treatment pending			0.75	2.40	1.05	0.35	
820	Wicklow Point, Broughton Island	Y		15-Jan-19	WP03 - pre	N		15-Jan-19	20	Full seine	9	31	15	4	Treatment ongoing	15-Jan-19	Hydrolicer (3 pens still require treatment in early February). Pre hydrolicer counts	0.45	1.55	0.75	0.20	
820	Wicklow Point, Broughton Island	Y		16-Jan-19	WP03 - post	N		16-Jan-19	40	Other - explain	6	8	12	1	Treatment ongoing	15-Jan-19	Post hydrolicer counts	0.15	0.20	0.30	0.03	
820	Wicklow Point, Broughton Island	Y		16-Jan-19	WP05 - pre	N		16-Jan-19	20	Full seine	16	26	17	0	Treatment ongoing	15-Jan-19	Post hydrolicer counts	0.80	1.30	0.85	0.00	
820	Wicklow Point, Broughton Island	Y		16-Jan-19	WP05 - post	N		16-Jan-19	60	Other - explain	16	20	8	2	Treatment ongoing	15-Jan-19	Post hydrolicer counts	0.27	0.38	0.13	0.03	
820	Wicklow Point, Broughton Island	Y		17-Jan-19	WP07 - pre	N		17-Jan-19	20	Full seine	13	25	20	3	Treatment ongoing	15-Jan-19	Post hydrolicer counts	0.65	1.25	1.00	0.15	
820	Wicklow Point, Broughton Island	Y		17-Jan-19	WP07 - post	N		17-Jan-19	50	Other - explain	6	9	12	1	Treatment ongoing	15-Jan-19	Post hydrolicer counts	0.12	0.18	0.24	0.02	
820	Wicklow Point, Broughton Island	Y		18-Jan-19	WP09 - pre	N		18-Jan-19	20	Full seine	8	31	17	1	Treatment ongoing	15-Jan-19	Post hydrolicer counts	0.40	1.55	0.85	0.05	
820	Wicklow Point, Broughton Island	Y		18-Jan-19	WP09 - post	N		18-Jan-19	40	Other - explain	9	12	18	0	Treatment ongoing	15-Jan-19	Post hydrolicer counts	0.23	0.30	0.45	0.00	
820	Wicklow Point, Broughton Island	Y		19-Jan-19	WP11 - pre	N		19-Jan-19	20	Full seine	34	43	8	1	Treatment ongoing	15-Jan-19	Post hydrolicer counts	1.70	2.15	0.40	0.05	
820	Wicklow Point, Broughton Island	Y		19-Jan-19	WP11 - post	N		19-Jan-19	50	Other - explain	19	20	3	0	Treatment ongoing	15-Jan-19	Post hydrolicer counts	0.38	0.40	0.06	0.00	

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Facility Reference No	Facility Name	Sampling Done This Month	If No Sampling, Explain	Sampling Event Start Date	Pen ID	Reference Pen	entry date	Pen Sample Date	Number of Fish Sampled	Sampling Method	Adult Females L. salmonis	Motile L. salmonis	Chilimus	Motile Coliga	Action Taken	Start Date (if PC or FC approval)	Comments	Items Pen sh	mol Pen sh	chal Pen sh	cal Pen sh
820	Wicklow Point, Broughton Island	Y		15-Jan-19	WP12 - pre	N		20-Jan-19	20	Full seine	25	53	43	4	Treatment ongoing	15-Jan-19	Pre hydrolyser counts	1.25	2.65	2.15	0.20
820	Wicklow Point, Broughton Island	Y		16-Jan-19	WP12 - post	N		20-Jan-19	50	Other - explain	13	38	27	0	Treatment ongoing	15-Jan-19	Post hydrolyser counts	0.76	0.36	0.44	0.00
820	Wicklow Point, Broughton Island	Y		15-Jan-19	WP10 - pre	N		21-Jan-19	20	Full seine	18	35	48	0	Treatment ongoing	15-Jan-19	Pre hydrolyser counts	0.90	1.75	2.40	0.00
820	Wicklow Point, Broughton Island	Y		16-Jan-19	WP10 - post	N		22-Jan-19	50	Other - explain	12	32	23	0	Treatment ongoing	15-Jan-19	Post hydrolyser counts	0.24	0.24	0.46	0.00
820	Wicklow Point, Broughton Island	Y		15-Jan-19	WP08 - pre	N		21-Jan-19	20	Full seine	14	27	31	0	Treatment ongoing	15-Jan-19	Pre hydrolyser counts	0.70	1.35	1.55	0.00
820	Wicklow Point, Broughton Island	Y		16-Jan-19	WP08 - post	N		22-Jan-19	40	Other - explain	7	9	10	0	Treatment ongoing	15-Jan-19	Post hydrolyser counts	0.18	0.23	0.25	0.00
820	Wicklow Point, Broughton Island	Y		27-Jan-19	WP02 - pre	N		27-Jan-19	20	Box seine	18	43	40	20	None required			0.90	2.15	2.00	1.00
820	Wicklow Point, Broughton Island	Y		27-Jan-19	WP03 - post	N		27-Jan-19	20	Box seine	2	2	9	8	None required			0.10	0.10	0.45	0.40
821	Glacial Falls, Watson Cove, Tribune Channel	N	Fallow																		
831	Shelter Passage, Wharft Island	Y		07-Jan-19	SH03	Y		07-Jan-19	20	Box seine	1	3	8	5	None required			0.05	0.15	0.40	0.25
831	Shelter Passage, Wharft Island	Y		07-Jan-19	SH04	N		07-Jan-19	20	Box seine	1	5	8	5	None required			0.05	0.25	0.40	0.25
831	Shelter Passage, Wharft Island	Y		07-Jan-19	SH11	N		07-Jan-19	20	Box seine	1	2	4	4	None required			0.05	0.10	0.20	0.20
831	Shelter Passage, Wharft Island	Y		14-Jan-19	SH03	Y		14-Jan-19	20	Box seine	1	2	2	0	None required			0.05	0.10	0.10	0.00
831	Shelter Passage, Wharft Island	Y		14-Jan-19	SH07	N		14-Jan-19	20	Box seine	0	0	2	0	None requ red			0.00	0.00	0.10	0.00
831	Shelter Passage, Wharft Island	Y		14-Jan-19	SH09	N		14-Jan-19	20	Box seine	0	0	1	0	None requ red			0.00	0.00	0.05	0.00
831	Shelter Passage, Wharft Island	Y		23-Jan-19	SH02	N		23-Jan-19	20	Box seine	1	4	4	1	None required			0.05	0.20	0.20	0.05
831	Shelter Passage, Wharft Island	Y		23-Jan-19	SH03	Y		23-Jan-19	20	Box seine	1	3	4	0	None requ red			0.05	0.15	0.20	0.00
831	Shelter Passage, Wharft Island	Y		23-Jan-19	SH04	N		23-Jan-19	20	Box seine	1	4	10	1	None requ red			0.05	0.20	0.50	0.05
831	Shelter Passage, Wharft Island	Y		27-Jan-19	SH05	N		27-Jan-19	20	Box seine	0	0	19	0	None required			0.00	0.00	0.95	0.00
831	Shelter Passage, Wharft Island	Y		27-Jan-19	SH07	N		27-Jan-19	20	Box seine	0	2	26	0	None requ red			0.00	0.10	1.30	0.00
831	Shelter Passage, Wharft Island	Y		27-Jan-19	SH03	Y		28-Jan-19	20	Box seine	0	2	47	5	None required			0.00	0.10	2.35	0.25
869	Maude Island, SE Broughton Is.	Y		16-Jan-19	110	N		16-Jan-19	20	Full seine	2	1	6	29	None required			0.10	0.10	0.35	1.20
869	Maude Island, SE Broughton Is.	Y		17-Jan-19	105	N		18-Jan-19	20	Full seine	0	0	3	30	None required			0.00	0.00	0.35	1.20
871	Barnes Bay, Sonora Island	Y		10-Jan-19	8	Y		10-Jan-19	20	Box seine	0	1	0	0	None required			0.05	0.10	0.00	0.00
871	Barnes Bay, Sonora Island	Y		10-Jan-19	11	N		10-Jan-19	20	Box seine	1	2	0	0	None required			0.05	0.10	0.00	0.00
871	Barnes Bay, Sonora Island	Y		10-Jan-19	12	N		10-Jan-19	20	Box seine	0	2	0	0	None required			0.05	0.25	1.30	0.05
882	Goleas Channel, S.E. Bell Island	Y		16-Jan-19	802	N		16-Jan-19	20	Box seine	1	5	26	1	None required			0.00	0.40	1.40	0.00
882	Goleas Channel, S.E. Bell Island	Y		16-Jan-19	804	Y		16-Jan-19	20	Box seine	0	2	28	0	None required			0.00	0.05	0.80	0.05
882	Goleas Channel, S.E. Bell Island	Y		23-Jan-19	802	N		23-Jan-19	20	Box seine	0	1	16	1	None required			0.05	0.10	0.70	0.10
882	Goleas Channel, S.E. Bell Island	Y		23-Jan-19	804	Y		23-Jan-19	20	Box seine	1	2	14	2	None required			0.35	0.80	0.30	0.00
882	Goleas Channel, S.E. Bell Island	Y		30-Jan-19	802	N		30-Jan-19	20	Box seine	7	16	6	0	None required			0.35	0.65	0.50	0.00
882	Goleas Channel, S.E. Bell Island	Y		30-Jan-19	804	Y		30-Jan-19	20	Box seine	7	13	10	0	None required			0.35	0.65	0.50	0.00
1059	Sargeant Passage, Tribune Channel	N	Recent transfer																		
1079	Steamer Point, Heate Channel	Y		12-Jan-19	13	N		17-Jan-19	20	Box seine	5	8	2	0				0.75	0.40	0.10	0.00
1079	Steamer Point, Heate Channel	Y		13-Jan-19	5	Y		13-Jan-19	20	Box seine	11	13	0	0				0.55	0.65	0.00	0.00
1079	Steamer Point, Heate Channel	Y		13-Jan-19	5	N		13-Jan-19	20	Box seine	13	15	1	0				0.65	0.75	0.05	0.00
1136	Shaw Point, Sunderland Channel	Y		10-Jan-19	5004	Y		10-Jan-19	20	Box seine	0	0	37	14	None required			0.00	0.00	1.85	0.70
1136	Shaw Point, Sunderland Channel	Y		10-Jan-19	5008	N		10-Jan-19	20	Box seine	16	34	15	4	None required			0.80	1.70	0.75	0.20
1136	Shaw Point, Sunderland Channel	Y		10-Jan-19	5012	N		10-Jan-19	20	Box seine	2	8	68	10	None required			0.10	0.40	3.40	0.50
1136	Shaw Point, Sunderland Channel	Y		10-Jan-19	5016	N		10-Jan-19	20	Box seine	3	5	57	8	None required			0.35	0.25	2.85	0.40
1136	Shaw Point, Sunderland Channel	Y		20-Jan-19	5004	Y		20-Jan-19	20	Box seine	1	19	16	2	None required			0.05	0.95	0.80	0.10
1136	Shaw Point, Sunderland Channel	Y		20-Jan-19	5008	N		20-Jan-19	20	Box seine	1	23	25	2	None required			0.05	3.15	1.25	0.10
1136	Shaw Point, Sunderland Channel	Y		26-Jan-19	5004	Y		26-Jan-19	20	Box seine	17	40	40	2	None required			0.85	2.00	2.00	0.10
1136	Shaw Point, Sunderland Channel	Y		26-Jan-19	5008	N		26-Jan-19	20	Box seine	9	37	48	2	None required			0.45	1.85	2.40	0.10
1136	Shaw Point, Sunderland Channel	Y		26-Jan-19	5012	N		26-Jan-19	20	Box seine	11	29	63	1	None required			0.55	1.45	3.15	0.05
1136	Shaw Point, Sunderland Channel	Y		26-Jan-19	5016	N		26-Jan-19	20	Box seine	13	35	62	2	None required			0.55	1.45	3.15	0.05
1144	Burwood Group, Raleigh Passage	Y		16-Jan-19	102	Y		16-Jan-19	20	Full seine	11	30	22	40	None required			0.55	1.50	1.10	2.00
1144	Burwood Group, Raleigh Passage	Y		19-Jan-19	106	N		19-Jan-19	20	Full seine	7	29	36	21	None required			0.35	1.45	1.80	1.05
1144	Burwood Group, Raleigh Passage	Y		19-Jan-19	108	N		19-Jan-19	20	Full seine	5	26	18	58	None required			0.25	1.30	0.90	2.90
1145	Blind Island, Herbert Inlet	N	Fallow																		
1148	Holowat South Point, Pinnace Channel	N	Fallow																		
1158	Paradise, NW side Frederick Arm	N	Fallow																		
1164	Egerton Creek, Frederick Arm	N	Fallow																		
1167	Baynor Group, Varg Island	N	Recent transfer																		
1237	Monday Rocks, Quatsino Sound	Y		03-Jan-19	MR01	Y		03-Jan-19	20	Box seine	0	0	6	1	None required			0.00	0.00	0.30	0.05
1237	Monday Rocks, Quatsino Sound	Y		03-Jan-19	MR03	N		03-Jan-19	20	Box seine	0	0	2	0	None required			0.00	0.00	0.10	0.00
1237	Monday Rocks, Quatsino Sound	Y		09-Jan-19	MR04	N		09-Jan-19	20	Box seine	0	3	6	2	None required			0.00	0.15	0.30	0.10
1237	Monday Rocks, Quatsino Sound	Y		09-Jan-19	MR01	Y		10-Jan-19	20	Box seine	1	2	6	1	None required			0.05	0.10	0.30	0.05
1237	Monday Rocks, Quatsino Sound	Y		09-Jan-19	MR05	N		10-Jan-19	20	Box seine	0	4	2	0	None required			0.05	0.10	0.30	0.05
1237	Monday Rocks, Quatsino Sound	Y		17-Jan-19	MR01	Y		17-Jan-19	20	Box seine	0	2	2	1	None required			0.00	0.20	0.10	0.00
1237	Monday Rocks, Quatsino Sound	Y		17-Jan-19	MR06	N		17-Jan-19	20	Box seine	0	2	2	1	None required			0.00	0.10	0.10	0.05
1237	Monday Rocks, Quatsino Sound	Y		24-Jan-19	MR01	Y		24-Jan-19	20	Box seine	1	3	2	3	None required			0.05	0.15	0.10	0.15
1237	Monday Rocks, Quatsino Sound	Y		24-Jan-19	MR07	N		24-Jan-19	20	Box seine	1	4	2	6	None required			0.05	0.20	0.10	0.30
1237	Monday Rocks, Quatsino Sound	Y		24-Jan-19	MR08	N		24-Jan-19	20	Box seine	1	3	4	3	None required			0.05	0.05	0.20	0.15
1237	Monday Rocks, Quatsino Sound	Y		30-Jan-19	MR01	Y		30-Jan-19	20	Box seine	0	2	5	2	None required			0.00	0.10	0.25	0.10

s.20(1)(b)

000369

Facility Reference No	Facility Name	Sampling Done This Month	If No Sampling, Explain	Sampling Event Start Date	Pen ID	Reference Pen	entry date	Pen Sample Date	Number of Fish Sampled	Sampling Method	Adult Females L. salmonis	Meiella L. salmonis	Chilimus	Meiella Coligus	Action Taken	Start Date (if fix or PC approval)	Comments	female per cent	male per cent	chilimus per cent	sh	h	sh	ah
1237	Monday Rocks, Quatsino Sound	Y		30-Jan-19	MR09	N		30-Jan-19	20	Box seine	0	1	3	3	None required			0.00	0.05	0.15	0.15	0.15	0.15	0.15
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		03-Jan-19	NW04	N		03-Jan-19	20	Box seine	0	0	1	0	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		05-Jan-19	NW05	N		05-Jan-19	20	Box seine	0	0	2	0	None required			0.00	0.00	0.10	0.10	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		08-Jan-19	NW06	N		08-Jan-19	20	Box seine	0	0	1	0	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		08-Jan-19	NW08	N		08-Jan-19	20	Box seine	0	0	1	0	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		08-Jan-19	NW09	N		08-Jan-19	20	Box seine	0	0	2	0	None required			0.00	0.00	0.10	0.10	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		16-Jan-19	NW04	N		16-Jan-19	20	Box seine	0	0	1	0	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		16-Jan-19	NW10	N		16-Jan-19	20	Box seine	0	0	1	0	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		23-Jan-19	NW01	N		23-Jan-19	20	Box seine	0	0	1	0	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		23-Jan-19	NW02	N		23-Jan-19	20	Box seine	0	0	0	0	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		23-Jan-19	NW04	N		23-Jan-19	20	Box seine	0	0	1	0	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1238	Mahatta West, Kosiimo Islands, Quatsino Sound	Y		23-Jan-19	DO05	N		23-Jan-19	20	Box seine	15	29	7	9	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1238	Doyle Island, Gordon Group	Y		12-Jan-19	DO08	N		12-Jan-19	20	Box seine	10	20	7	8	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1288	Doyle Island, Gordon Group	Y		16-Jan-19	DO01	N		16-Jan-19	20	Box seine	7	18	34	6	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1288	Doyle Island, Gordon Group	Y		16-Jan-19	DO02	N		16-Jan-19	20	Box seine	8	28	55	0	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1288	Doyle Island, Gordon Group	Y		16-Jan-19	DO04	N		16-Jan-19	20	Box seine	15	38	38	7	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1288	Doyle Island, Gordon Group	Y		30-Jan-19	DO06	N		30-Jan-19	20	Box seine	7	32	39	13	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1291	McIntyre Lake, Bechwell Sound	N	Fallow																					
1293	Duncan Island, Goletas Channel	Y		16-Jan-19	DU02	N		16-Jan-19	20	Dipnet-feed	16	33	24	7	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1293	Duncan Island, Goletas Channel	Y		23-Jan-19	DU02	N		23-Jan-19	20	Dipnet-feed	6	9	6	4	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1293	Duncan Island, Goletas Channel	Y		23-Jan-19	DU07	N		23-Jan-19	20	Dipnet-feed	9	22	9	3	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1293	Duncan Island, Goletas Channel	Y		23-Jan-19	DU08	N		23-Jan-19	20	Dipnet-feed	8	21	8	1	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1293	Duncan Island, Goletas Channel	Y		30-Jan-19	DU02	N		30-Jan-19	20	Dipnet-feed	13	18	4	4	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1293	Duncan Island, Goletas Channel	Y		30-Jan-19	DU10	N		30-Jan-19	20	Dipnet-feed	0	6	29	5	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1293	Duncan Island, Goletas Channel	Y		30-Jan-19	DU11	N		30-Jan-19	20	Dipnet-feed	1	4	12	1	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1299	Thorpe Point, Isobring Inlet	N	Fallow																					
1300	Athorpes, Sunderland Channel	Y		07-Jan-19	AP01	N		07-Jan-19	20	Box seine	2	12	39	0	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		07-Jan-19	AP04	N		07-Jan-19	20	Box seine	2	12	34	21	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		07-Jan-19	AP06	N		07-Jan-19	20	Box seine	2	12	24	33	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		14-Jan-19	AP03	N		14-Jan-19	20	Box seine	4	10	1	4	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		14-Jan-19	AP05	N		14-Jan-19	20	Box seine	4	51	0	45	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		20-Jan-19	AP01	N		20-Jan-19	20	Box seine	8	27	82	146	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		20-Jan-19	AP02	N		20-Jan-19	20	Box seine	8	74	40	55	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		20-Jan-19	AP04	N		20-Jan-19	20	Box seine	8	45	33	70	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		20-Jan-19	AP04	N		20-Jan-19	20	Box seine	0	21	37	77	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		29-Jan-19	AP05	N		29-Jan-19	20	Box seine	2	8	29	72	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1300	Athorpes, Sunderland Channel	Y		29-Jan-19	AP06	N		29-Jan-19	20	Box seine	1	16	36	62	Treatment pending			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1335	Wells Bay, Wells Passage	N	Fallow																					
1338	Simmonds Bay, Wells Passage	N	Fallow																					
1350	Shelter Bay, Richards Channel	Y		04-Jan-19	S803	N		04-Jan-19	20	Box seine	0	3	5	6	None required			0.00	0.15	0.25	0.25	0.30	0.30	0.30
1350	Shelter Bay, Richards Channel	Y		04-Jan-19	S804	N		04-Jan-19	20	Box seine	1	3	1	5	None required			0.00	0.15	0.25	0.25	0.30	0.30	0.30
1350	Shelter Bay, Richards Channel	Y		11-Jan-19	S804	N		11-Jan-19	20	Box seine	4	10	1	4	None required			0.10	0.40	0.30	0.30	0.10	0.10	0.10
1350	Shelter Bay, Richards Channel	Y		11-Jan-19	S807	N		11-Jan-19	20	Box seine	4	9	5	3	None required			0.20	0.45	0.25	0.25	0.15	0.15	0.15
1350	Shelter Bay, Richards Channel	Y		15-Jan-19	S802	N		15-Jan-19	20	Box seine	0	0	0	0	None required			0.00	0.00	0.00	0.00	0.00	0.00	0.00
1350	Shelter Bay, Richards Channel	Y		15-Jan-19	S804	N		15-Jan-19	20	Box seine	0	0	0	0	None required			0.00	0.00	0.00	0.00	0.00	0.00	0.00
1350	Shelter Bay, Richards Channel	Y		21-Jan-19	S804	N		21-Jan-19	20	Box seine	3	13	0	2	None required			0.00	0.00	0.00	0.00	0.00	0.00	0.00
1350	Shelter Bay, Richards Channel	Y		21-Jan-19	S806	N		21-Jan-19	20	Box seine	0	14	13	4	None required			0.15	0.65	0.00	0.00	0.10	0.10	0.10
1350	Shelter Bay, Richards Channel	Y		29-Jan-19	S801	N		29-Jan-19	20	Box seine	1	3	9	0	None required			0.00	0.20	0.70	0.70	0.65	0.65	0.65
1350	Shelter Bay, Richards Channel	Y		29-Jan-19	S804	N		29-Jan-19	20	Box seine	0	0	2	0	None required			0.00	0.00	0.10	0.10	0.00	0.00	0.00
1350	Shelter Bay, Richards Channel	Y		29-Jan-19	S809	N		29-Jan-19	20	Box seine	0	1	9	0	None required			0.00	0.05	0.45	0.45	0.00	0.00	0.00
1351	March Bay, Stuart Rock N. of P. Hardy	Y		04-Jan-19	MB04	N		04-Jan-19	20	Box seine	0	1	0	0	None required			0.00	0.00	0.05	0.05	0.00	0.00	0.00
1351	March Bay, Stuart Rock N. of P. Hardy	Y		04-Jan-19	MB05	N		04-Jan-19	20	Box seine	0	0	0	0	None required			0.00	0.00	0.00	0.00	0.00	0.00	0.00
1351	March Bay, Stuart Rock N. of P. Hardy	Y		04-Jan-19	MB08	N		04-Jan-19	20	Box seine	0	0	0	0	None required			0.00	0.00	0.00	0.00	0.00	0.00	0.00
1351	March Bay, Stuart Rock N. of P. Hardy	Y		24-Jan-19	MB03	N		24-Jan-19	20	Box seine	0	3	18	5	None required			0.00	0.15	0.90	0.90	0.25	0.25	0.25
1351	March Bay, Stuart Rock N. of P. Hardy	Y		24-Jan-19	MB04	N		24-Jan-19	20	Box seine	0	3	10	11	None required			0.00	0.15	0.50	0.50	0.55	0.55	0.55
1351	March Bay, Stuart Rock N. of P. Hardy	Y		24-Jan-19	MB08	N		24-Jan-19	20	Box seine	0	1	23	4	None required			0.00	0.05	1.15	1.15	0.20	0.20	0.20
1376	Clough Creek, Quatsino Sound	N	Fallow																					
1382	Robertson Island, Richards Channel	Y		20-Jan-19	RO02	N		20-Jan-19	20	Box seine	65	85	46	29	Treatment pending			3.25	4.25	2.30	2.30	1.45	1.45	1.45
1382	Robertson Island, Richards Channel	Y		20-Jan-19	RO04	N		20-Jan-19	20	Box seine	36	67	67	25	Treatment pending			1.80	3.35	3.35	3.35	1.25	1.25	1.25
1382	Robertson Island, Richards Channel	Y		20-Jan-19	RO06	N		20-Jan-19	20	Box seine	49	31	31	25	Treatment pending			1.95	2.95	1.55	1.55	1.25	1.25	1.25
1382	Robertson Island, Richards Channel	Y		25-Jan-19	RO03	N		25-Jan-19	20	Box seine	37	69	64	27	Treatment pending			2.35	3.45	4.20	4.20	1.35	1.35	1.35
1382	Robertson Island, Richards Channel	Y		25-Jan-19	RO04	N		25-Jan-19	20	Box seine	59	98	73	35	Treatment pending			2.95	4.90	3.65	3.65	1.75	1.75	1.75
1382	Robertson Island, Richards Channel	Y		25-Jan-19	RO05	N		25-Jan-19	20	Box seine	48	94	59	30	Treatment pending			2.40	4.70	2.95	2.95	1.50	1.50	1.50

s.20(1)(b)

000360

Facility Reference No	Facility Name	Sampling Done This Month	If No Sampling, Explain	Sampling Event Start Date	Pen ID	Reference Pen	entry date	Pen Sample Date	Number of Fish Sampled	Sampling Method	Adult Females L. salmonis	Mottle L. salmonis	Chilimus	Mottle Coligus	Action Taken	Start Date (If Rx or PC approval)	Comments	form perf sh	mot perf sh	chal perf sh	col perf sh
1401	Brent Island, Okislo Channel	Y		05-Jan-19	106	N		05-Jan-19	20	Full seine	2	4	0	4	None required			0.10	0.20	0.00	0.20
1401	Brent Island, Okislo Channel	Y		05-Jan-19	105	N		05-Jan-19	20	Full seine	2	4	0	3	None required			0.10	0.20	0.00	0.15
1401	Brent Island, Okislo Channel	Y		05-Jan-19	103	Y		05-Jan-19	20	Full seine	3	7	0	3	None required			0.15	0.35	0.00	0.15
1507	Millar Channel, 2km S Hayden Passage	Y		04-Jan-19	108	N		04-Jan-19	20	Full seine	0	0	0	0	None required			0.00	0.00	0.00	0.00
1507	Millar Channel, 2km S Hayden Passage	Y		04-Jan-19	102	Y		04-Jan-19	20	Full seine	0	0	0	2	None required			0.00	0.00	0.00	0.10
1537	Millar Channel, 2km S Hayden Passage	Y		05-Jan-19	109	N		05-Jan-19	20	Full seine	0	1	0	3	None required			0.00	0.05	0.00	0.15
1537	Bare Bluff, Clayoquot Snd, Redwell Snd	Y		19-Jan-19	106	N		19-Jan-19	20	Full seine	105	138	0	0	Treatment ongoing	31-Jan-19		5.75	9.90	0.00	0.00
1537	Bare Bluff, Clayoquot Snd, Redwell Snd	Y		19-Jan-19	103	N		19-Jan-19	20	Full seine	99	160	2	0	Treatment ongoing	31-Jan-19		4.95	8.00	0.00	0.05
1537	Bare Bluff, Clayoquot Snd, Redwell Snd	Y		20-Jan-19	105	Y		20-Jan-19	20	Full seine	84	181	2	0	Treatment ongoing	31-Jan-19		4.20	9.05	0.10	0.00
1581	Hardwicke Is. Site B, Chancellor Channel	Y		07-Jan-19	HW01	Y		07-Jan-19	20	Box seine	18	33	16	5	Treatment pending			0.90	1.65	0.80	0.25
1581	Hardwicke Is. Site B, Chancellor Channel	Y		07-Jan-19	HW02	N		07-Jan-19	20	Box seine	1	9	42	18	Treatment pending			0.05	0.45	2.20	0.90
1581	Hardwicke Is. Site B, Chancellor Channel	Y		12-Jan-19	HW01	Y		12-Jan-19	20	Box seine	13	51	30	26	Treatment pending			0.65	2.55	1.50	1.30
1581	Hardwicke Is. Site B, Chancellor Channel	Y		12-Jan-19	HW02	N		12-Jan-19	20	Box seine	0	8	62	61	Treatment pending			0.00	0.40	3.10	3.05
1581	Hardwicke Is. Site B, Chancellor Channel	Y		12-Jan-19	HW04	N		12-Jan-19	20	Box seine	12	35	42	57	Treatment pending			0.65	1.75	2.10	2.85
1581	Hardwicke Is. Site B, Chancellor Channel	Y		21-Jan-19	HW01	Y		21-Jan-19	20	Box seine	12	31	28	15	Treatment pending			0.60	1.55	1.40	0.75
1581	Hardwicke Is. Site B, Chancellor Channel	Y		21-Jan-19	HW06	N		21-Jan-19	20	Box seine	1	13	30	21	Treatment pending			0.05	0.85	1.50	1.05
1581	Hardwicke Is. Site B, Chancellor Channel	Y		25-Jan-19	HW01	Y		25-Jan-19	20	Box seine	16	66	15	52	Treatment pending			0.80	3.40	0.75	2.60
1581	Hardwicke Is. Site B, Chancellor Channel	Y		25-Jan-19	HW09	N		25-Jan-19	20	Box seine	19	88	212	112	Treatment pending			0.95	4.40	10.60	5.60
1581	Hardwicke Is. Site B, Chancellor Channel	Y		25-Jan-19	HW07	N		25-Jan-19	21	Box seine	30	64	71	67	Treatment pending			1.43	3.05	3.38	3.19
1581	Hardwicke Is. Site B, Chancellor Channel	Y		29-Jan-19	HW03	N		29-Jan-19	20	Box seine	19	50	34	62	Treatment pending			0.95	2.50	1.70	3.10
1581	Hardwicke Is. Site B, Chancellor Channel	Y		29-Jan-19	HW05	N		29-Jan-19	20	Box seine	24	66	26	37	Treatment pending			1.20	3.30	3.80	1.85
1581	Hardwicke Is. Site B, Chancellor Channel	Y		29-Jan-19	HW08	N		29-Jan-19	20	Box seine	7	75	96	65	Treatment pending			0.35	3.75	3.80	3.25
1581	Hardwicke Is. Site B, Chancellor Channel	Y		29-Jan-19	HW08	N		29-Jan-19	20	Box seine	8	80	71	73	Treatment pending			0.40	4.00	5.55	3.65
1581	Hardwicke Is. Site B, Chancellor Channel	Y		07-Jan-19	D001	N		07-Jan-19	20	Box seine	5	14	114	106	Treatment pending			0.25	0.70	3.70	3.30
1586	Doctor Islets, Knight Inlet	Y		07-Jan-19	D003	N		07-Jan-19	20	Box seine	1	3	79	77	Treatment pending			0.05	0.15	3.95	3.85
1586	Doctor Islets, Knight Inlet	Y		07-Jan-19	D004	N		07-Jan-19	20	Box seine	2	13	85	80	Treatment pending			0.10	0.85	4.25	4.00
1586	Doctor Islets, Knight Inlet	Y		14-Jan-19	D001	Y		14-Jan-19	20	Box seine	4	17	228	11	Treatment pending			0.70	0.85	1.40	0.55
1586	Doctor Islets, Knight Inlet	Y		14-Jan-19	D002	N		14-Jan-19	20	Box seine	4	12	181	25	Treatment pending			0.20	0.50	3.65	3.50
1586	Doctor Islets, Knight Inlet	Y		21-Jan-19	D001	Y		21-Jan-19	20	Box seine	4	10	172	116	Treatment pending			0.30	0.80	4.65	4.50
1586	Doctor Islets, Knight Inlet	Y		21-Jan-19	D002	N		21-Jan-19	20	Box seine	1	16	133	78	Treatment pending			0.05	0.90	6.65	3.90
1586	Doctor Islets, Knight Inlet	Y		21-Jan-19	D007	N		21-Jan-19	20	Box seine	8	15	225	73	Treatment pending			0.40	0.75	11.25	3.65
1586	Doctor Islets, Knight Inlet	Y		21-Jan-19	D008	N		21-Jan-19	20	Box seine	5	12	353	56	Treatment pending			0.20	0.40	14.25	1.65
1586	Doctor Islets, Knight Inlet	Y		25-Jan-19	D001	Y		25-Jan-19	20	Box seine	5	12	353	56	Treatment pending			0.25	0.60	15.15	2.60
1586	Doctor Islets, Knight Inlet	Y		29-Jan-19	D005	N		29-Jan-19	20	Box seine	5	12	125	88	Treatment pending			0.25	0.60	6.15	4.40
1608	Humany Islet, Tribble Channel	N	Harvest ongoing																		
1691	Kid Bay, Roderick Island	Y		12-Jan-19	K801	N		13-Jan-19	20	Box seine	0	0	0	3	Treatment ongoing	28-Dec-18		0.00	0.00	0.00	0.15
1691	Kid Bay, Roderick Island	Y		05-Jan-19	K801 - pre	N		05-Jan-19	20	Box seine	15	34	6	10	Treatment ongoing	28-Dec-18		0.80	1.70	0.30	0.50
1691	Kid Bay, Roderick Island	Y		05-Jan-19	K802	N		05-Jan-19	20	Box seine	0	1	0	0	Treatment ongoing	29-Dec-18		0.00	0.05	0.00	0.00
1691	Kid Bay, Roderick Island	Y		05-Jan-19	K802 - pre	N		05-Jan-19	20	Box seine	7	17	5	16	Treatment ongoing	29-Dec-18		0.35	0.85	0.25	0.80
1691	Kid Bay, Roderick Island	Y		05-Jan-19	K803	N		05-Jan-19	20	Box seine	11	24	9	1	Treatment ongoing	29-Dec-18		0.55	1.20	0.45	0.05
1691	Kid Bay, Roderick Island	Y		05-Jan-19	K804	N		05-Jan-19	20	Box seine	0	0	0	3	Treatment ongoing	29-Dec-18		0.00	0.00	0.00	0.15
1691	Kid Bay, Roderick Island	Y		02-Jan-19	K804 - pre	N		04-Jan-19	20	Box seine	13	26	3	0	Treatment ongoing	29-Dec-18		0.65	1.30	0.15	0.00
1691	Kid Bay, Roderick Island	Y		16-Jan-19	K805	N		16-Jan-19	20	Box seine	2	2	2	0	Treatment ongoing	29-Dec-18		0.10	0.10	0.00	0.00
1691	Kid Bay, Roderick Island	Y		21-Jan-19	K805	N		21-Jan-19	20	Box seine	0	1	0	2	Treatment ongoing	29-Dec-18		0.00	0.05	0.20	0.30
1691	Kid Bay, Roderick Island	Y		05-Jan-19	K805 - pre	N		05-Jan-19	20	Box seine	11	21	4	6	Treatment ongoing	29-Dec-18		0.55	1.05	0.20	0.30
1691	Kid Bay, Roderick Island	Y		01-Jan-19	K806	N		01-Jan-19	20	Box seine	0	0	0	1	Treatment ongoing	29-Dec-18		0.00	0.00	0.00	0.05
1691	Kid Bay, Roderick Island	Y		01-Jan-19	K807	N		01-Jan-19	20	Box seine	18	37	13	21	Treatment ongoing	29-Dec-18		0.90	1.85	0.55	1.05
1691	Kid Bay, Roderick Island	Y		16-Jan-19	K807 - pre	N		16-Jan-19	20	Box seine	0	2	0	0	Treatment ongoing	29-Dec-18		0.90	1.35	0.15	0.25
1691	Kid Bay, Roderick Island	Y		02-Jan-19	K808	N		02-Jan-19	20	Box seine	18	27	3	5	Treatment ongoing	29-Dec-18		0.00	0.00	0.00	0.00
1691	Kid Bay, Roderick Island	Y		23-Jan-19	K809	N		23-Jan-19	20	Box seine	3	5	1	2	Treatment ongoing	29-Dec-18		0.15	0.25	0.05	0.10
1691	Kid Bay, Roderick Island	Y		20-Jan-19	K809 - pre	N		20-Jan-19	20	Box seine	21	31	0	0	Treatment ongoing	29-Dec-18		1.05	1.55	0.00	0.00
1691	Kid Bay, Roderick Island	Y		02-Jan-19	K810	N		02-Jan-19	20	Box seine	0	0	0	0	Treatment ongoing	29-Dec-18		0.00	0.00	0.00	0.00
1691	Kid Bay, Roderick Island	Y		01-Jan-19	K812	N		01-Jan-19	20	Box seine	0	0	0	1	Treatment ongoing	29-Dec-18		0.00	0.00	0.00	0.05
1691	Kid Bay, Roderick Island	Y		12-Jan-19	K813	N		12-Jan-19	20	Box seine	0	0	1	0	Treatment ongoing	29-Dec-18		0.00	0.00	0.05	0.00
1697	Colbuden Point, Jarvis Inlet	N	Recent transfer																		
1698	Athabasca Point, Jarvis Inlet	N	Fallow																		
1700	Murchison Inlet, Nootka District	N	Fallow																		
1702	Goat Cove, Roderick Island	N	Harvest ongoing																		
1705	Williamson Passage, Nootka Sound	Y		13-Jan-19	3	Y		13-Jan-19	20	Box seine	0	0	0	0				0.00	0.00	0.00	0.00
1705	Williamson Passage, Nootka Sound	Y		13-Jan-19	5	N		13-Jan-19	20	Box seine	0	1	0	0				0.00	0.05	0.00	0.00
1705	Williamson Passage, Nootka Sound	Y		13-Jan-19	7	N		13-Jan-19	20	Box seine	0	0	0	0				0.00	0.00	0.00	0.00
1738	Atrevida Point, Hanna Channel	N	Fallow																		
1762	Gore Island, King Passage	N	Recent transfer																		
1789	Concepcion Pt., Bligh Island	Y		25-Jan-19	10	Y		25-Jan-19	20	Box seine	0	0	0	0				0.00	0.00	0.00	0.00
1789	Concepcion Pt., Bligh Island	Y		26-Jan-19	7	N		26-Jan-19	20	Box seine	0	0	0	0				0.00	0.00	0.00	0.00

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Facility Reference No	Facility Name	Sampling Done This Month	If No Sampling, Explain	Sampling Event Start Date	Pen ID	Reference Pen	entry date	Pen Sample Date	Number of fish Sampled	Sampling Method	Adult females L salmonids	Moltie L salmonids	Challinus	Moltie	Action Taken	Start Date (If ok or PC approval)	Comments	sh	sh	mot	perf	ca	perf	sh	h	sh
1769	Conception Pt., Bligh Island	Y		26-Jan-19	8	N		26-Jan-19	40	Box seine	0	0	0	0				0.00	0.00							
1875	Noo-La, Clo Channel	Y		09-Jan-19	2	Y		09-Jan-19	20	Box seine	4	7	1	16				0.20	0.35	0.05	0.80					
1825	Noo-La, Clo Channel	Y		09-Jan-19	2	Y		09-Jan-19	20	Box seine	0	5	6	13				0.00	0.25	0.30	0.65					
1825	Noo-La, Clo Channel	Y		09-Jan-19	9	N		09-Jan-19	20	Box seine	0	4	14	16				0.00	0.20	0.70	0.80					
1825	Noo-La, Clo Channel	Y		23-Jan-19	1	N		23-Jan-19	20	Box seine	0	7	28	79				0.20	0.35	1.40	3.95					
1825	Noo-La, Clo Channel	Y		23-Jan-19	2	Y		23-Jan-19	20	Box seine	1	3	39	96				0.05	0.15	1.95	4.80					
1825	Noo-La, Clo Channel	Y		23-Jan-19	3	Y		23-Jan-19	20	Box seine	1	3	28	43				0.05	0.15	1.40	2.15					
1829	Wa-kwa	Y		14-Jan-19	1	N		14-Jan-19	20	Box seine	0	2	0	127				0.00	0.10	0.00	0.35					
1839	Wa-kwa	Y		14-Jan-19	2	Y		14-Jan-19	20	Box seine	2	24	39	7				0.10	1.20	1.95	0.35					
1839	Michaliet Inlet North, Noctua Sound	Y		14-Jan-19	3	Y		14-Jan-19	20	Box seine	3	7	0	187				0.15	0.35	0.00	0.00					
1849	Michaliet Inlet North, Noctua Sound	Y		14-Jan-19	14	Y		14-Jan-19	20	Box seine	0	0	0	0				0.00	0.00	0.00	0.00					
1849	Michaliet Inlet North, Noctua Sound	Y		14-Jan-19	14	Y		14-Jan-19	20	Box seine	0	0	0	0				0.00	0.00	0.00	0.00					
1862	Hecate, Hecate Channel	Y		06-Jan-19	2	Y		06-Jan-19	20	Box seine	84	120	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	4.20	6.00	0.00	0.00				
1862	Hecate, Hecate Channel	Y		06-Jan-19	4	N		06-Jan-19	20	Box seine	57	98	0	3		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	2.85	4.90	0.00	0.15				
1862	Hecate, Hecate Channel	Y		06-Jan-19	7	N		06-Jan-19	20	Box seine	47	75	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	2.35	3.75	0.00	0.00				
1862	Hecate, Hecate Channel	Y		17-Jan-19	8	N		17-Jan-19	20	Box seine	13	0	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.65	0.65	0.00	0.00				
1862	Hecate, Hecate Channel	Y		19-Jan-19	11	N		19-Jan-19	20	Box seine	10	13	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.50	0.50	0.00	0.00				
1862	Hecate, Hecate Channel	Y		19-Jan-19	12	N		19-Jan-19	20	Box seine	7	0	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.35	0.40	0.00	0.00				
1862	Hecate, Hecate Channel	Y		20-Jan-19	9	N		20-Jan-19	20	Box seine	9	11	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.45	0.55	0.00	0.00				
1862	Hecate, Hecate Channel	Y		21-Jan-19	5	N		21-Jan-19	20	Box seine	6	6	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.30	0.30	0.00	0.00				
1862	Hecate, Hecate Channel	Y		23-Jan-19	4	N		23-Jan-19	20	Box seine	4	0	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.20	0.20	0.00	0.00				
1862	Hecate, Hecate Channel	Y		24-Jan-19	5	N		24-Jan-19	20	Box seine	9	9	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.45	0.45	0.00	0.00				
1862	Hecate, Hecate Channel	Y		24-Jan-19	2	N		24-Jan-19	20	Box seine	5	5	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.25	0.25	0.00	0.00				
1862	Hecate, Hecate Channel	Y		25-Jan-19	2	N		25-Jan-19	20	Box seine	21	21	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	1.05	1.05	0.00	0.00				
1862	Hecate, Hecate Channel	Y		25-Jan-19	3	N		25-Jan-19	20	Box seine	28	29	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	1.40	1.45	0.00	0.00				
1862	Hecate, Hecate Channel	Y		26-Jan-19	1	Y		26-Jan-19	20	Box seine	12	12	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.60	0.60	0.00	0.00				
1862	Hecate, Hecate Channel	Y		29-Jan-19	5	N		29-Jan-19	20	Box seine	5	5	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.25	0.25	0.00	0.00				
1862	Hecate, Hecate Channel	Y		29-Jan-19	7	N		29-Jan-19	20	Box seine	5	5	0	1		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.25	0.25	0.00	0.00				
1862	Hecate, Hecate Channel	Y		29-Jan-19	8	N		29-Jan-19	20	Box seine	14	17	0	0		Treatment ongoing	17-Jan-19	Hydrogen Peroxide	0.70	0.85	0.00	0.00				
1863	Esperanza, Hecate Channel	Y		09-Jan-19	6	N		09-Jan-19	20	Box seine	19	27	0	0				0.95	1.35	0.00	0.00					
1863	Esperanza, Hecate Channel	Y		11-Jan-19	2	Y		11-Jan-19	20	Box seine	20	37	0	0				1.00	1.85	0.00	0.00					
1863	Esperanza, Hecate Channel	Y		11-Jan-19	4	N		11-Jan-19	20	Box seine	14	25	0	0				0.70	1.25	0.00	0.00					
1895	Sheep Passage in vicinity of Pooley Isl.	N	Fallow																							
1896	Ume Bay, vicinity of Pooey Island	N	Fallow																							
6668	Plover Point, Fortune Channel,	Y		06-Jan-19	101	Y		06-Jan-19	20	Full seine	60	74	0	0		None required		3.00	3.70	0.00	0.00					
6668	Plover Point, Fortune Channel,	Y		07-Jan-19	108	N		07-Jan-19	20	Full seine	44	74	1	0		None required		2.20	3.70	0.05	0.00					
6668	Plover Point, Fortune Channel,	Y		07-Jan-19	110	N		07-Jan-19	20	Full seine	49	85	0	0		None required		2.45	4.25	0.00	0.00					
7053	Ghi va, Bull Barbour, Ropes Isl	N	Fallow																							
7053	Ghi va, Bull Barbour, Ropes Isl	N	Fallow																							
7054	Wanx-tals (Heath Bay)	Y		14-Jan-19	1	N		14-Jan-19		Box seine	6	11	8	172				0.30	0.55	0.40	8.60					
7273	Ta-sya (Ministrel Island)	Y		14-Jan-19	2	Y		14-Jan-19	20	Box seine	2	7	4	176				0.10	0.35	0.70	8.80					
7273	Ta-sya (Ministrel Island)	Y		14-Jan-19	3	N		14-Jan-19	20	Box seine	0	2	14	135				0.00	0.10	0.70	6.75					
7713	Cougar Bay, Toline Channel	N	Fallow																							
7714	Alexander Inlet	Y		05-Jan-19	A003	N		05-Jan-19	20	Box seine	2	7	48	111		Treatment pending		0.10	0.35	2.45	5.55					
7714	Alexander Inlet	Y		05-Jan-19	A001	N		05-Jan-19	20	Box seine	1	6	38	97		Treatment pending		0.05	0.30	1.90	4.85					
7714	Alexander Inlet	Y		05-Jan-19	A001	N		05-Jan-19	20	Box seine	0	12	50	125		Treatment pending		0.00	0.60	2.50	6.25					
7714	Alexander Inlet	Y		12-Jan-19	A007	N		12-Jan-19	20	Box seine	2	9	20	45		Treatment pending		0.10	0.45	1.45	2.25					
7714	Alexander Inlet	Y		13-Jan-19	A004	N		13-Jan-19	20	Box seine	2	10	40	103		Treatment pending		0.10	0.50	2.00	5.15					
7714	Alexander Inlet	Y		13-Jan-19	A004	N		13-Jan-19	20	Box seine	2	6	50	153		Treatment pending		0.10	0.30	2.50	7.65					
7714	Alexander Inlet	Y		25-Jan-19	A004	N		25-Jan-19	20	Box seine	0	13	36	20		Treatment pending		0.00	0.65	1.75	100					
7714	Alexander Inlet	Y		25-Jan-19	A002	N		25-Jan-19	20	Box seine	2	5	10	17		Treatment pending		0.10	0.25	0.50	0.85					
7714	Alexander Inlet	Y		25-Jan-19	A003	N		25-Jan-19	20	Box seine	2	6	32	18		Treatment pending		0.10	0.30	1.60	0.90					
7714	Alexander Inlet	Y		25-Jan-19	A004	N		25-Jan-19	20	Box seine	1	13	9	16		Treatment pending		0.05	0.65	0.45	0.80					

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Year	Introductions and Transfers Licence Number	Licence Start Date	Licence End Date	Source Facility Reference Number	Source Facility Name	Source Facility Risk Health Zone	Destination Facility Reference Number	Destination Facility Name	Destination Facility Health Zone	Licence Holder	Species	Lifestage	Transfer Type	Comments	Source Facility Inspection Date	Record Review Date	Fish Health Concern(s) Identified (Y/N)	Nature of Concern(s) Identified	Mitigation Measures	Transfer Decision
2015	1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	1537	Bare Bluff	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.1						
2015	1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	728	Sir Edmund Bay, NE Shore Broughton Inlet	3.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.1						
2015	1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	7114	Yaakswil, Millar Channel, East of Flores Island	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.1						
2015	1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	1472	West Side, Bedwell Sound	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.1						
2015	1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	169	Barkley, San Mateo Bay, Barkley Dist.	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.1						
2015	1.1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	1537	Bare Bluff	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.2						
2015	1.1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	728	Sir Edmund Bay, NE Shore Broughton Inlet	3.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.2						
2015	1.1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	1148	Binns Island, Herbert Inlet	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.2						
2015	1.1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	1472	West Side, Bedwell Sound	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.2						
2015	1.1	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	169	Barkley, San Mateo Bay, Barkley Dist.	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 1.2						
2015	1.2	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	1537	Bare Bluff	2.3	Cermaq	Atlantic Salmon	Smolts								
2015	1.2	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	728	Sir Edmund Bay, NE Shore Broughton Inlet	3.3	Cermaq	Atlantic Salmon	Smolts								
2015	1.2	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	1148	Binns Island, Herbert Inlet	2.3	Cermaq	Atlantic Salmon	Smolts								
2015	1.2	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	1472	West Side, Bedwell Sound	2.3	Cermaq	Atlantic Salmon	Smolts								
2015	1.2	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	169	Barkley, San Mateo Bay, Barkley Dist.	2.3	Cermaq	Atlantic Salmon	Smolts								
2015	1.2	08-Sep-15	07-Dec-15	693	Boot Lagoon Hatchery	2.3	304	Raza Island, Raza Passaga	3.2	Cermaq	Atlantic Salmon	Smolts								
2015	2	08-Sep-15	07-Dec-15	1697	Jarvis Inlet	3.1	871	Barnes Bay, Sonora Island	3.2	Grieg Seafood	Atlantic Salmon	Smolts								
2015	3	08-Sep-15	07-Dec-15	1880	Gold River Hatchery	2.1	1079	Channel	2.4	Grieg Seafood	Atlantic Salmon	Smolts		Replaced by 3.1						
2015	3.1	08-Sep-15	07-Dec-15	1880	Gold River Hatchery	2.1	1079	Channel	2.4	Grieg Seafood	Atlantic Salmon	Smolts								
2015	4	08-Sep-15	07-Dec-15	387	Lena Creek Hatchery	3.1	1079	Channel	2.4	Paradise Trading Corp.	Atlantic Salmon	Smolts								
2015	5	08-Sep-15	07-Dec-15	799	Upper Retreat Passage	3.3	211	Sonora Island	3.2	Marine Harvest Canada	Atlantic Salmon	Smolts								
2015	6	18-Sep-15	17-Dec-15	506	Little Bear Bay, N. of Campbell River	2.1	728	Sir Edmund Bay, NE Shore Broughton Inlet	3.3	Cermaq	Atlantic Salmon	Smolts								
2015	6	18-Sep-15	17-Dec-15	506	Little Bear Bay, N. of Campbell River	2.1	304	Raza Island, Raza Passaga	3.2	Cermaq	Atlantic Salmon	Smolts		Replaced by 7.1						
2015	7	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	1537	Bare Bluff	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 7.1						
2015	7	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	728	Sir Edmund Bay, NE Shore Broughton Inlet	3.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 7.1						
2015	7	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	304	Raza Island, Raza Passaga	3.2	Cermaq	Atlantic Salmon	Smolts								
2015	7	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	7114	Yaakswil, Millar Channel, East of Flores Island	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 7.1						
2015	7	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	1472	West Side, Bedwell Sound	2.3	Cermaq	Atlantic Salmon	Smolts		Replaced by 7.1						
2015	7.1	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	1537	Bare Bluff	2.3	Cermaq	Atlantic Salmon	Smolts								
2015	7.1	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	728	Sir Edmund Bay, NE Shore Broughton Inlet	3.3	Cermaq	Atlantic Salmon	Smolts								
2015	7.1	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	304	Raza Island, Raza Passaga	3.2	Cermaq	Atlantic Salmon	Smolts								
2015	7.1	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	1148	Binns Island, Herbert Inlet	2.3	Cermaq	Atlantic Salmon	Smolts								
2015	7.1	18-Sep-15	17-Dec-15	180	Ocean Farm Hatchery	2.1	1472	West Side, Bedwell Sound	2.3	Cermaq	Atlantic Salmon	Smolts								
2015	8	21-Sep-15	20-Dec-15	1350	Shelher Bay, Richards Channel	3.4	7093	GH Va, Bull Harbour, Hope Isl	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts								
2015	9	21-Sep-15	20-Dec-15	892	Goleas Channel, S.E. Bell Island	3.2	7093	GH Va, Bull Harbour, Hope Isl	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts								
2015	10	21-Sep-15	20-Dec-15	892	Goleas Channel, S.E. Bell Island	3.2	1351	Marsh Bay, Stuart Rock N. of P. Hardy	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts								
2015	11	21-Sep-15	20-Dec-15	1350	Shelher Bay, Richards Channel	3.4	1351	Marsh Bay, Stuart Rock N. of P. Hardy	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts								

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2016	39	12-Jan-16	11-Apr-16	Big Tree Creek Hatchery	79	2.2	831	Shelter Passage	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts	Replaced by 33.1
2016	39.1	12-Jan-16	11-Apr-16	Big Tree Creek Hatchery	79	2.2	831	Shelter Passage	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	94	15-Jan-16	14-Apr-16	Ocean Falls Hatchery	1689	3.5	1580	Jackson Passage	3.5 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	35	22-Feb-16	21-May-16	Ocean Farm Hatchery	180	2.1	540	Fortune Channel	2.3 Cermaq	Atlantic Salmon	Smolts	Replaced by 35.1
2016	35	22-Feb-16	21-May-16	Ocean Farm Hatchery	180	2.1	527	Saranac Island	2.3 Cermaq	Atlantic Salmon	Smolts	Replaced by 35.1
2016	35	22-Feb-16	21-May-16	Ocean Farm Hatchery	180	2.1	526	Rant Point, Clayoquot Sound	2.3 Cermaq	Atlantic Salmon	Smolts	Replaced by 35.1
2016	35	22-Feb-16	21-May-16	Ocean Farm Hatchery	180	2.1	869	Maude Island	3.3 Cermaq	Atlantic Salmon	Smolts	Replaced by 35.1
2016	35.1	22-Feb-16	21-May-16	Ocean Farm Hatchery	180	2.1	540	Fortune Channel	2.3 Cermaq	Atlantic Salmon	Smolts	
2016	35.1	22-Feb-16	21-May-16	Ocean Farm Hatchery	180	2.1	527	Saranac Island	2.3 Cermaq	Atlantic Salmon	Smolts	
2016	35.1	22-Feb-16	21-May-16	Ocean Farm Hatchery	180	2.1	526	Rant Point, Clayoquot Sound	2.3 Cermaq	Atlantic Salmon	Smolts	
2016	35.1	22-Feb-16	21-May-16	Ocean Farm Hatchery	180	2.1	869	Maude Island	3.3 Cermaq	Atlantic Salmon	Smolts	
2016	35.1	22-Feb-16	21-May-16	Ocean Farm Hatchery	180	2.1	1825	Noo-Li, Clio Channel	3.3 Cermaq	Atlantic Salmon	Smolts	
2016	36	01-Mar-16	31-Mar-16	506 Little Bear Bay Hatchery	506	2.2	1144	Burwood Group, Raleigh Passage	3.3 Cermaq	Atlantic Salmon	Smolts	
2016	37	22-Feb-16	21-May-16	691 Boot Lagoon Hatchery	691	2.3	540	Fortune Channel	2.3 Cermaq	Atlantic Salmon	Smolts	Replaced by 37.1
2016	37	22-Feb-16	21-May-16	691 Boot Lagoon Hatchery	691	2.3	527	Saranac Island	2.3 Cermaq	Atlantic Salmon	Smolts	Replaced by 37.1
2016	37	22-Feb-16	21-May-16	691 Boot Lagoon Hatchery	691	2.3	526	Rant Point	2.3 Cermaq	Atlantic Salmon	Smolts	Replaced by 37.1
2016	37	22-Feb-16	21-May-16	691 Boot Lagoon Hatchery	691	2.3	869	Maude Island	3.3 Cermaq	Atlantic Salmon	Smolts	Replaced by 37.1
2016	37.1	22-Feb-16	21-May-16	691 Boot Lagoon Hatchery	691	2.3	540	Fortune Channel	2.3 Cermaq	Atlantic Salmon	Smolts	
2016	37.1	22-Feb-16	21-May-16	691 Boot Lagoon Hatchery	691	2.3	527	Saranac Island	2.3 Cermaq	Atlantic Salmon	Smolts	
2016	37.1	22-Feb-16	21-May-16	691 Boot Lagoon Hatchery	691	2.3	526	Rant Point	2.3 Cermaq	Atlantic Salmon	Smolts	
2016	37.1	22-Feb-16	21-May-16	691 Boot Lagoon Hatchery	691	2.3	869	Maude Island	3.3 Cermaq	Atlantic Salmon	Smolts	
2016	37.1	22-Feb-16	21-May-16	691 Boot Lagoon Hatchery	691	2.3	1825	Noo-Li, Clio Channel	3.3 Cermaq	Atlantic Salmon	Smolts	
2016	38	01-Mar-16	01-Jun-16	819 Ceil Island Hatchery	47	3.3	456	Cypress Harbour	3.3 Cermaq	Atlantic Salmon	Adult	
2016	39	22-Feb-16	21-May-16	Dalrymple Hatchery	47	2.2	821	Gilcat Falls	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	40	09-Mar-16	06-Jun-16	387 Lena Creek Hatchery	387	3.1	1839	Wa-hwa	3.3 Grig Seafood	Atlantic Salmon	Smolts	
2016	40	09-Mar-16	06-Jun-16	387 Lena Creek Hatchery	387	3.1	1825	Noo-Li, Clio Channel	3.3 Grig Seafood	Atlantic Salmon	Smolts	
2016	41	22-Mar-16	21-Jun-16	Dalrymple Hatchery	47	2.2	465	Swanson Island	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	42	01-Apr-16	30-Jun-16	Ocean Farm Hatchery	180	2.1	1835	Noo-Li, Clio Channel	3.3 Cermaq	Atlantic Salmon	Smolts	
2016	43	08-Apr-16	07-Jul-16	221 Freshwater Farms Steamer Point Hatchery	221	2.1	1145	Ports Bay	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Replaced by 44.1
2016	44	31-Mar-16	30-Jun-16	1079 Hecate Channel Hatchery	1079	2.4	1825	Noo-Li, Clio Channel	3.3 Grig Seafood	Atlantic Salmon	Smolts	
2016	44.1	06-Apr-16	30-Jun-16	1079 Hecate Channel Hatchery	1079	2.4	1825	Noo-Li, Clio Channel	3.3 Grig Seafood	Atlantic Salmon	Smolts	
2016	44.1	06-Apr-16	30-Jun-16	1079 Hecate Channel Hatchery	1079	2.4	1863	Espérance, Hecate Channel	2.4 Grig Seafood	Atlantic Salmon	Smolts	
2016	45	31-Mar-16	30-Jun-16	1863 Esperanza Inlet Hatchery	1863	2.4	1825	Noo-Li, Clio Channel	3.3 Grig Seafood	Atlantic Salmon	Smolts	
2016	46	25-Apr-16	30-Jul-16	884 Lochlach Bay Hatchery	884	3.5	1895	Sheep Passage	3.5 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	47	21-Apr-16	30-Jul-16	739 Upper Retreat Hatchery	739	3.3	790	Chancellor Channel	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	48	21-Apr-16	30-Jul-16	739 Upper Retreat Hatchery	739	3.3	100	Lees Bay, N. Shore Channel	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	49	21-Apr-16	30-Jul-16	739 Upper Retreat Hatchery	739	3.3	78	Phillips Arm, Cardero Channel	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	50	25-Apr-16	30-Jul-16	141 Port Elizabeth Hatchery	141	3.3	78	Phillips Arm, Cardero Channel	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	51	27-Apr-16	30-Jul-16	821 Glacier Falls Hatchery	821	3.3	100	Lees Bay	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	
2016	52	05-Jun-16	05-Sep-16	Sea Spring Hatchery	445	2.1	233	Indian Bay, Tofino Inlet	2.3 Creative Salmon	Chinook Salmon	Smolts	
2016	53	09-May-16	30-Jul-16	244 Inlet Hatchery	244	2.3	233	Indian Bay, Tofino Inlet	2.3 Creative Salmon	Chinook Salmon	Adult	
2016	54	15-May-16	31-Jul-16	47 Hatchery	47	2.2	820	Island	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	

2016	55	14-Jun-16	30-Sep-16	Yellow Island Aquaculture (1994) Ltd. Hatchery	218	Site 9, North	3.2	East of Maude Island, Discovery Passage	Yellow Island Aquaculture 3.2 (1994) Ltd.	Chinook Salmon	Smolts								
2016	56	01-Jun-16	31-Jul-16	Site 9, North Hatchery	412	Salmon Inlet	3.1	746 Site 13, Sechart Inlet	3.1 Greg Seafood	Atlantic Salmon	Smolts								
2016	56	01-Jun-16	31-Jul-16	Site 9, North Hatchery	412	Salmon Inlet	3.1	332 Inlet	3.1 Greg Seafood	Atlantic Salmon	Smolts								
2016	57	20-Jun-16	19-Sep-16	Goleias Channel, Noo-La, Clio	892	S.E. Bell Island	3.4	1293 Channel	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts								
2016	58	15-Jul-16	15-Oct-16	Noo-La, Clio	1025	Channel	3.3	1839 Wa-twa	3.3 Greg Seafood	Atlantic Salmon	Smolts								
2016	59	28-Jun-16	30-Sep-16	Shelter Passage, Port Elizabeth, Gifford Island	831	Wishart Island	3.4	1288 Doyle Island, Gordon Group	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts								
2016	60	09-Aug-16	09-Nov-16	Port Elizabeth, Gifford Island	141	Salmon Inlet	3.3	380 Sonora Pt., Nodules Channel	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts								
2016	61	21-Aug-16	21-Nov-16	Boat Lagoon	691	Boat Lagoon	2.3	234 Dion Point, Shelter Inlet	2.3 Carmaq	Atlantic Salmon	Smolts								
2016	61	21-Aug-16	21-Nov-16	Boat Lagoon	691	Boat Lagoon	2.3	314 Ross Pass, Northwest Midway	2.3 Carmaq	Atlantic Salmon	Smolts								
2016	61	21-Aug-16	21-Nov-16	Boat Lagoon	691	Boat Lagoon	2.3	548 Mussel Rock, Clayoquot Sound	2.3 Carmaq	Atlantic Salmon	Smolts								
2016	62	09-Sep-16	09-Dec-16	Sea Spring Hatchery	445	Sea Spring Hatchery	2.1	1899 Warner Island, Tofino Inlet	2.3 Creative Salmon	Chinook Salmon	Smolts								
2016	63	12-Aug-16	12-Nov-16	Glacial Falls, Watson Cove, Ocean Farm	821	Tribune Channel	3.3	100 Lees Bay, N. Shore, West Tofino	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts								
2016	64	30-Aug-16	21-Nov-16	Gold River Hatchery	180	Gold River Hatchery	2.1	234 Dion Point, Shelter Inlet	2.3 Carmaq	Atlantic Salmon	Smolts								
2016	65	15-Sep-16	30-Nov-16	Gold River Hatchery	1880	Gold River Hatchery	2.4	1789 Concepcion Pt., Bligh Island	2.4 Greg Seafood	Atlantic Salmon	Smolts								
2016	65	15-Sep-16	30-Nov-16	Gold River Hatchery	1880	Gold River Hatchery	2.4	1738 Atrevida Point, Hanna Channel	2.4 Greg Seafood	Atlantic Salmon	Smolts								
2016	65	15-Sep-16	30-Nov-16	Gold River Hatchery	1880	Gold River Hatchery	2.4	1700 Muchalat Inlet South, Nooit	2.4 Greg Seafood	Atlantic Salmon	Smolts								
2016	65	15-Sep-16	30-Nov-16	Gold River Hatchery	1880	Gold River Hatchery	2.4	1849 Muchalat Inlet North, Nooit	2.4 Greg Seafood	Atlantic Salmon	Smolts								
2016	66	19-Sep-16	16-Dec-16	Midsummer Island, Spring Passage	467	Midsummer Island, Spring Passage	3.3	1145 Potts Bay, Midsummer Island	3.3 Marine Harvest Canada	Atlantic Salmon	Adult								
2016	66	19-Sep-16	16-Dec-16	Midsummer Island, Spring Passage	467	Midsummer Island, Spring Passage	3.3	303 Glacial Creek, near Jarvis Inlet	3.3 Marine Harvest Canada	Atlantic Salmon	Adult								
2016	68	15-Sep-16	30-Nov-16	Lena Creek	387	Lena Creek	3.1	1738 Atrevida Point, Hanna Channel	2.4 Paradise Trading Corp	Atlantic Salmon	Smolts								
2016	68	15-Sep-16	30-Nov-16	Lena Creek	387	Lena Creek	3.1	1700 Muchalat Inlet South, Nooit	2.4 Paradise Trading Corp	Atlantic Salmon	Smolts								
2016	68	15-Sep-16	30-Nov-16	Lena Creek	387	Lena Creek	3.1	1849 Muchalat Inlet North, Nooit	2.4 Paradise Trading Corp	Atlantic Salmon	Smolts								
2016	68A	21-Nov-16	02-Dec-16	Lena Creek	387	Lena Creek	3.1	1738 Atrevida Point, Hanna Channel	2.4 Paradise Trading Corp	Atlantic Salmon	Smolts								
2016	68A	21-Nov-16	02-Dec-16	Lena Creek	387	Lena Creek	3.1	1789 Concepcion Pt., Bligh Island	2.4 Paradise Trading Corp	Atlantic Salmon	Smolts								
2016	68A	21-Nov-16	02-Dec-16	Lena Creek	387	Lena Creek	3.1	1700 Muchalat Inlet South, Nooit	2.4 Paradise Trading Corp	Atlantic Salmon	Smolts								
2016	68A	21-Nov-16	02-Dec-16	Lena Creek	387	Lena Creek	3.1	1849 Muchalat Inlet North, Nooit	2.4 Paradise Trading Corp	Atlantic Salmon	Smolts								
2016	69	22-Sep-16	08-Dec-16	Shelter Passage, Wishart Island	831	Wishart Island	3.4	1288 Doyle Island, Gordon Group	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts								
2016	69.1	22-Sep-16	08-Dec-16	Shelter Passage, Wishart Island	831	Wishart Island	3.4	1288 Doyle Island, Gordon Group	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts								
2016	70	23-Sep-16	08-Dec-16	Swanson Island, North side	465	Swanson Island, North side	3.3	1331 Hardwicke Is. Site B, Chance	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts								
2016	71	27-Sep-16	09-Dec-16	Little Bear Bay, N. of Campbell River	506	Little Bear Bay, N. of Campbell River	2.2	1738 Atrevida Point, Hanna Channel	2.4 Carmaq	Atlantic Salmon	Smolts								
2016	71	27-Sep-16	09-Dec-16	Little Bear Bay, N. of Campbell River	506	Little Bear Bay, N. of Campbell River	2.2	1849 Muchalat Inlet North, Nooit	2.4 Carmaq	Atlantic Salmon	Smolts								
2016	71	27-Sep-16	09-Dec-16	Little Bear Bay, N. of Campbell River	506	Little Bear Bay, N. of Campbell River	2.2	1700 Muchalat Inlet South, Nooit	2.4 Carmaq	Atlantic Salmon	Smolts								
2016	72	06-Oct-16	16-Dec-16	Delimode Hatchery	47	Delimode Hatchery	2.2	1237 Monday Rocks, Quatsino Sound	2.4 Marine Harvest Canada	Atlantic Salmon	Smolts								

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2016	73	06-Oct-16	21-Dec-16	Dallymple Hatchery	47	2.2	144	Koskimo Bay, Quatsino Sound	2.4 Marine Harvest Canada	Atlantic Salmon	Smolts	Replaced by 79.1					
2016	73.1	03-Nov-16	21-Dec-16	Dallymple Hatchery	47	2.2	144	Koskimo Bay, Quatsino Sound	2.4 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	74	09-Oct-16	23-Dec-16	Shelter Passage, Whistler Island	831	3.4	1581	Hardwicke Is. Site B, Chance	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	75	11-Oct-16	27-Dec-16	79 Big Tree Creek	79	2.2	1586	Dorset Inlets, Knight Inlet	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Replaced by 76.1					
2016	76	11-Oct-16	27-Dec-16	79 Big Tree Creek	79	2.2	1300	Athorp, Sunderland Channel	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Replaced by 76.1					
2016	76	11-Oct-16	27-Dec-16	79 Big Tree Creek	79	2.2	790	Chancellor Channel, West T	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	76.1	14-Oct-16	26-Dec-16	79 Big Tree Creek	79	2.2	1300	Athorp, Sunderland Channel	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	77	06-Oct-16	28-Dec-16	553.1 George Lake Site	553.1	2.4	144	Koskimo Bay, Quatsino Sound	2.4 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	78	08-Oct-16	29-Dec-16	1689 Ocean Falls	1689	3.5	7714	Alexander Inlet	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	79	12-Oct-16	29-Dec-16	Wicklow Point	820	3.3	1300	Athorp, Sunderland Channel	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	79	12-Oct-16	29-Dec-16	Wicklow Point	820	3.3	1581	Hardwicke Is. Site B, Chance	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	80	06-Oct-16	04-Jan-17	Shelter Passage, Whistler Island	831	3.4	1300	Athorp, Sunderland Channel	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	81	10-Nov-16	25-Jan-17	1580 Jackson Pass	1580	3.3	1895	Sheep Passage In vicinity of f	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	82	16-Nov-16	04-Feb-17	691 Boot Lagoon Ocean Farm	691	2.3	543	Mussel Rock, Clayquot Sound	2.3 Cernaq	Atlantic Salmon	Smolts						
2016	83	16-Nov-16	04-Feb-17	180 Hatchery Gold River	180	2.1	543	Mussel Rock, Clayquot Sound	2.3 Cernaq	Atlantic Salmon	Smolts						
2016	84	16-Nov-16	16-Feb-17	1680 Hatchery Gold River	1680	2.4	1789	Conception Pt., Bligh Island	2.4 Greig Seafood	Atlantic Salmon	Smolts						
2016	84	16-Nov-16	16-Feb-17	1680 Hatchery Gold River	1680	2.4	1697	Culloden Point, Jarvis Inlet	3.1 Greig Seafood	Atlantic Salmon	Smolts						
2016	85	16-Nov-16	16-Feb-17	387 Lena Creek	387	3.1	1789	Conception Pt., Bligh Island	2.4 Greig Seafood	Atlantic Salmon	Smolts						
2016																	
2016	87	07-Dec-16	23-Feb-17	Shelter Passage, Whistler Island	831	3.4	1288	Doyle Island, Gordon Group	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	88	15-Dec-16	28-Feb-17	691 Boot Lagoon	691	2.3	1698	Athorp Point, Jarvis Inlet	3.1 Cernaq	Atlantic Salmon	Smolts	Replaced by 88.1					
2016	88.1	20-Dec-16	28-Feb-17	691 Boot Lagoon	691	2.3	1698	Athorp Point, Jarvis Inlet	3.1 Cernaq	Atlantic Salmon	Smolts						
2016	88.1	20-Dec-16	28-Feb-17	691 Boot Lagoon	691	2.3	1697	Culloden Point, Jarvis Inlet	3.1 Cernaq	Atlantic Salmon	Smolts						
2016	89	15-Dec-16	28-Feb-17	506 of Campbell River	506	2.2	1698	Athorp Point, Jarvis Inlet	3.1 Cernaq	Atlantic Salmon	Smolts	Replaced by 89.1					
2016	89.1	20-Dec-16	28-Feb-17	506 of Campbell River	506	2.2	1698	Athorp Point, Jarvis Inlet	3.1 Cernaq	Atlantic Salmon	Smolts						
2016	89.1	20-Dec-16	28-Feb-17	506 of Campbell River	506	2.2	1697	Culloden Point, Jarvis Inlet	3.1 Cernaq	Atlantic Salmon	Smolts						
2016	90	15-Dec-16	28-Feb-17	180 Hatchery Ocean Farm	180	2.1	1698	Athorp Point, Jarvis Inlet	3.1 Cernaq	Atlantic Salmon	Smolts	Replaced by 90.1					
2016	90.1	20-Dec-16	28-Feb-17	180 Hatchery Ocean Farm	180	2.1	1698	Athorp Point, Jarvis Inlet	3.1 Cernaq	Atlantic Salmon	Smolts						
2016	90.1	20-Dec-16	28-Feb-17	180 Hatchery Ocean Farm	180	2.1	1697	Culloden Point, Jarvis Inlet	3.1 Cernaq	Atlantic Salmon	Smolts						
2016	91	14-Dec-16	01-Mar-17	Dawley Passage, Fortune Channel	1594	2.3	1899	Warne Island, Tofino Inlet	2.3 Creative Salmon	Chinook Salmon	Adult						
2016	92	04-Jan-17	18-Mar-17	79 Big Tree Creek	79	2.2	1059	Sargeant Passage, Tribune	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	92	04-Jan-17	18-Mar-17	79 Big Tree Creek	79	2.2	141	Port Elizabeth, Clifford Island	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	93	04-Jan-17	18-Mar-17	1689 Ocean Falls	1689	3.5	1059	Sargeant Passage, Tribune	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts						
2016	94	28-Dec-16	16-Mar-17	Midsummer Island, Spring	467	3.3	1145	Potts Bay, Midsummer Island	3.3 Marine Harvest Canada	Atlantic Salmon	Adult						
2017	95	19-Jan-17	19-Apr-17	506 Hatchery Little Bear Bay	506	2.2	1336	Simmonds Point	3.4 Cernaq	Atlantic Salmon	Smolts						
2017	95	19-Jan-17	19-Apr-17	506 Hatchery Little Bear Bay	506	2.2	458	Cypress Harbour	3.3 Cernaq	Atlantic Salmon	Smolts						
2017	95	19-Jan-17	19-Apr-17	506 Hatchery Little Bear Bay	506	2.2	819	Cecil Island	3.3 Cernaq	Atlantic Salmon	Smolts						

2017	95	19-Jan-17	19-Apr-17	Little Bear Bay Hatchery	506	2.2	1335	Wehlie Bay	3.4 Cernaqa	Atlantic Salmon	Smolts							
2017	96	25-Jan-17	25-Apr-17	Gold River Hatchery	1680	2.4	1698	Ahtstrom Point	3.1 Gleg Seafood	Atlantic Salmon	Smolts							
2017	96	25-Jan-17	25-Apr-17	Gold River Hatchery	1680	2.4	1697	Culoden Point	3.1 Gleg Seafood	Atlantic Salmon	Smolts							
2017	97	21-Feb-17	25-May-17	Boot Lagoon Hatchery	691	2.3	526	Rare Point	2.3 Cernaqa	Atlantic Salmon	Smolts							
2017	97	21-Feb-17	25-May-17	Boot Lagoon Hatchery	691	2.3	227	Bawden Point	2.3 Cernaqa	Atlantic Salmon	Smolts							
2017	98	21-Feb-17	21-May-17	Ocean Farm Hatchery	180	2.1	526	Rare Point	2.3 Cernaqa	Atlantic Salmon	Smolts							
2017	98	21-Feb-17	21-May-17	Ocean Farm Hatchery	180	2.1	227	Bawden Point	2.3 Cernaqa	Atlantic Salmon	Smolts							
2017	99	03-Mar-17	09-Jun-17	Sea Spring Hatchery	445	2.1	1899	Warne Island	2.3 Creative Salmon	Chinook Salmon	Smolts	Replaced by 100%						
2017	100	17-Feb-17	17-May-17	Dairyville Hatchery	47	2.2	1059	Sargeant Pass	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	100A	17-Feb-17	17-May-17	Dairyville Hatchery	47	2.2	1059	Sargeant Pass	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	100A	17-Feb-17	17-May-17	Dairyville Hatchery	47	2.2	892	Ball Island	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	101	17-Feb-17	17-May-17	Dairyville Hatchery	47	2.3	1507	Miller Channel	2.3 Cernaqa	Atlantic Salmon	Smolts							
2017	101	17-Feb-17	17-May-17	Dairyville Hatchery	47	2.3	527	Serranic Island	2.3 Cernaqa	Atlantic Salmon	Smolts							
2017	102	17-Feb-17	17-May-17	Musall Rock Hatchery	543	3.5	892	Ball Island	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	103	17-Mar-17	17-Jun-17	Ocean Falls Hatchery	1689	3.5	821	Glacial Falls	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	103	17-Mar-17	17-Jun-17	Ocean Falls Hatchery	1689	3.5	7713	Cougar Bay	3.5 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	103	17-Mar-17	17-Jun-17	Ocean Falls Hatchery	1689	3.5	1350	Shelter Bay	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	104	17-Mar-17	17-Jun-17	Freshwater Farms Hatchery	271	2.1	1145	Potts Bay	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	105	27-Mar-17	27-Jun-17	Ocean Farm Hatchery	180	2.1	1698	Ahtstrom Point	3.1 Cernaqa	Atlantic Salmon	Smolts							
2017	105	27-Mar-17	27-Jun-17	Ocean Farm Hatchery	180	2.1	1697	Culoden Point	3.1 Cernaqa	Atlantic Salmon	Smolts							
2017	106	27-Mar-17	27-Jun-17	Boot Lagoon Hatchery	691	2.3	1698	Ahtstrom Point	3.1 Cernaqa	Atlantic Salmon	Smolts							
2017	106	27-Mar-17	27-Jun-17	Boot Lagoon Hatchery	691	2.3	1697	Culoden Point	3.1 Cernaqa	Atlantic Salmon	Smolts							
2017	107	30-Mar-17	30-Jun-17	1237 Monday Rocks Hatchery	1237	2.4	1338	Mahatta East	2.4 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	108	30-Mar-17	30-Jun-17	244 Kostimo Bay Hatchery	244	2.4	1338	Mahatta East	2.4 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	109	07-Apr-17	07-Jul-17	1697 Culoden Point Hatchery	1697	3.1	871	Barnes Bay	3.2 Gleg Seafood	Atlantic Salmon	Smolts							
2017	110	07-Apr-17	07-Jul-17	Dairyville Hatchery	47	2.2	1350	Shelter Bay	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	111	28-Apr-17	28-Jul-17	Dairyville Hatchery	47	2.2	1618	Humphrey Rock	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	112	09-May-17	09-Aug-17	141 Port Elizabeth Hatchery	141	3.3	7053	Bull Harbour	3.1 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	113	10-May-17	10-Aug-17	Gold River Hatchery	1680	2.4	1698	Ahtstrom Point	3.1 Gleg Seafood	Atlantic Salmon	Smolts							
2017	113	10-May-17	10-Aug-17	Gold River Hatchery	1680	2.4	1697	Culoden Point	3.1 Gleg Seafood	Atlantic Salmon	Smolts	Replaced by 114.1						
2017	114	12-May-17	12-Aug-17	1336 Simmonds Point Hatchery	1336	3.4	306	Venture Point	3.2 Cernaqa	Atlantic Salmon	Adults							
2017	114.1	12-May-17	12-Aug-17	1336 Simmonds Point Hatchery	1336	3.4	306	Venture Point	3.2 Cernaqa	Atlantic Salmon	Adults							
2017	115	12-May-17	12-Aug-17	Cecil Island Hatchery	813	3.3	1401	Brent Island	3.2 Cernaqa	Atlantic Salmon	Adults							
2017	116	10-May-17	10-Aug-17	Sea Spring Hatchery	445	2.1	776	Baxter Islet	2.3 Creative Salmon	Chinook Salmon	Smolts							
2017	117	19-May-17	19-Aug-17	Big Tree Creek Hatchery	79	2.2	1689	Ocean Falls Hatchery	3.5 Marine Harvest Canada	Atlantic Salmon	Fry							
2017	118	31-May-17	20-Sep-17	Yellow Island Hatchery	218	3.2	216	East of Maude Island	3.2 Yellow Island Aquaculture Ltd	Chinook Salmon	Smolts							
2017	119	23-Jun-17	23-Sep-17	Doctor Bay Hatchery	457	3.2	456	Doctor Bay, West Redonda I	3.2 Sabstream Engineering Ltd.	Chinook Salmon	Smolts							
2017	120	21-Jun-17	21-Sep-17	Freshwater Farms Hatchery	271	2.1	1689	Ocean Falls Hatchery	3.5 Marine Harvest Canada	Atlantic Salmon	Fry							
2017	121	25-Jul-17	25-Oct-17	141 Port Elizabeth Hatchery	141	3.3	7053	Bull Harbour	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	122	27-Jul-17	27-Oct-17	211 Sonora Island Hatchery	211	3.3	211	Sonora Island	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	123	27-Jul-17	27-Oct-17	1059 Sargeant Pass Hatchery	1059	3.3	211	Sonora Island	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	124	17-Aug-17	17-Nov-17	821 Glacial Falls Hatchery	821	3.3	467	Midsummer Island	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	125	17-Aug-17	17-Nov-17	1618 Humphrey Rock Hatchery	1618	3.3	467	Midsummer Island	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	126	15-Sep-17	15-Dec-17	1789 Atrevida Point Hatchery	1789	2.4	1762	Gore Island	2.4 Gleg Seafood	Atlantic Salmon	Smolts							
2017	127	15-Sep-17	15-Dec-17	1789 Conception Point Hatchery	1789	2.4	1762	Gore Island	2.4 Gleg Seafood	Atlantic Salmon	Smolts							
2017	128	15-Sep-17	15-Dec-17	1709 Scotts Bay Hatchery	1709	2.4	1762	Gore Island	2.4 Gleg Seafood	Atlantic Salmon	Smolts							
2017	129	18-Aug-17	18-Nov-17	1580 Doctor Islet Hatchery	1580	2.3	1300	Ahtstrom	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts							
2017	130	18-Sep-17	15-Dec-17	691 Boot Lagoon Hatchery	691	2.3	1537	Bare Bluff, Claypoint Snd, Be	2.3 Cernaqa	Atlantic Salmon	Smolts							
2017	131	15-Sep-17	15-Dec-17	Ocean Farm Hatchery	180	2.1	1537	Bare Bluff, Claypoint Snd, Be	2.3 Cernaqa	Atlantic Salmon	Smolts							
2017	132	31-Aug-17	30-Nov-17	Sea Spring Hatchery	445	2.1	1596	Dawley Pass	2.3 Creative Salmon	Chinook Salmon	Smolts							
2017	133	12-Sep-17	12-Dec-17	892 Ball Island Hatchery	892	3.4	7054	Heath Bay	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts							

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2018	160	18-Jan-18	18-Apr-18	Shaw Point, Sunderland Channel	1136	3	303	Glacial Creek	3.3	Marine Harvest Canada	Atlantic Salmon	Adult	Marine to marine	Relinquished by IS-1	16-Sep-17	17-Jan-18	Yes	Pre-transfer antibiotic treatment; freshwater bath treatment during transfer; post-transfer monitoring.	Licence issued
2018	161	16-Jan-18	16-Apr-18	79 Big Tree Creek	79	2.2	831	Shelter Passage, Wishart Isd	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		07-Nov-17	15-Jan-18	No		Licence issued
2018	161.1	19-Jan-18	16-Apr-18	79 Big Tree Creek	79	2.2	831	Shelter Passage, Wishart Isd	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		07-Nov-17	15-Jan-18	No		Licence issued
2018	162	16-Jan-18	16-Apr-18	1689 Ocean Falls	1689	3.5	1288	Doyle Island	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		27-Sep-17	15-Jan-17	No		Licence issued
2018	163	19-Jan-18	19-Apr-18	Gold River	1680	2.4	1825	Noo-La, Clio Channel	3.3	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Jan-18	17-Jan-18	No		Licence issued
2018	163	19-Jan-18	19-Apr-18	Gold River	1680	2.4	1839	Wa-ka	3.3	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Jan-18	17-Jan-18	No		Licence issued
2018	164	23-Jan-18	23-Apr-18	691 Boot Lagoon	691	2.3	458	Cypress Harbour	3.3	Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		12-Jan-18	12-Jan-18	No		Licence issued
2018	165	25-Jan-18	15-Apr-18	180 Ocean Farms	180	2.1	458	Cypress Harbour	3.3	Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		16-Jan-18	18-Jan-18	No		Licence issued
2018	166	23-Jan-18	23-Apr-18	141 Port Elizabeth	141	3.3	143	Lansen Island	3.3	Marine Harvest Canada	Atlantic Salmon	Smolts	Marine to marine		17-Oct-17	15-Jan-18	Yes	Pre-transfer grading; post-transfer monitoring; reporting and treatment if warranted; density reduction	Licence issued
2018	167	01-Feb-18	02-May-18	Shaw Point, Sunderland Channel	1136	3.3	303	Glacial Creek	3.3	Marine Harvest Canada	Atlantic Salmon		Marine to marine		14-Sep-17	17-Jan-18	Yes		Licence issued
2018	168	05-Feb-18	06-May-18	271 Freshwater Farms	271	2.1	1136	Shaw Point	3.3	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		30-Jan-18	30-Jan-18	No		Licence issued
2018	169	13-Feb-18	23-Apr-18	Potts Bay, Midsummer Island	1145	3.3	1136	Shaw Point	3.3	Marine Harvest Canada	Atlantic Salmon		Marine to marine		N/A	07-Feb-18	No		Licence issued
2018	170	16-Feb-18	17-May-18	691 Boot Lagoon	691	2.3	1144	Burdwood Group, Raleigh Pt	3.3	Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		12-Jan-18	09-Feb-18	No		Licence issued
2018	170	16-Feb-18	17-May-18	691 Boot Lagoon	691	2.3	540	Fortune Channel, East side V	2.3	Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		12-Jan-18	09-Feb-18	No		Licence issued
2018	171	16-Feb-18	17-May-18	506 of Campbell River	506	2.2	1144	Burdwood Group, Raleigh Pt	3.3	Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		07-Feb-18	12-Feb-18	No		Licence issued
2018	172	16-Feb-18	17-May-18	180 Hatchery	180	2.1	1144	Burdwood Group, Raleigh Pt	3.3	Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		16-Jan-18	13-Feb-18	No		Licence issued
2018	172	16-Feb-18	17-May-18	180 Hatchery	180	2.1	540	Fortune Channel, East side V	2.3	Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		16-Jan-18	13-Feb-18	No		Licence issued
2018	173	22-Mar-18	20-Jun-18	387 Lena Creek	387	3.1	1825	Noo-La, Clio Channel	3.3	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		22-Feb-18	16-Mar-18	No		Licence issued
2018	173	22-Mar-18	20-Jun-18	387 Lena Creek	387	3.1	1839	Wa-ka	3.3	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		22-Feb-18	16-Mar-18	No		Licence issued
2018	174	15-Feb-18	15-May-18	47 Hatchery	47	2.2	831	Shelter Passage, Wishart Island	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		01-Dec-18	02-Feb-18	No		Licence issued
2018	175	05-Mar-18	09-Jun-18	892 Bell Island	892	3.4	831	Island	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		30-Jan-18	05-Mar-18	No		Licence issued

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2018	176	23-Mar-18	21-Jun-18	1689 Ocean Falls	3.5	465 Swanson	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		22-Feb-18	06-Mar-18	No	Licence issued	
2018	177	09-Mar-18	07-Jun-18	1689 Ocean Falls	3.5	820 Wicklow Point, Broughton Is	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		22-Feb-18	06-Mar-18	No	Licence issued	
2018	178	16-Mar-18	14-Jun-18	691 Boot Lagoon	2.3	1825 Noo-La, Clio Channel	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine	Replaced by 178.1	12-Jan-18	29-Mar-18	No	Licence issued	
2018	178	16-Mar-18	14-Jun-18	691 Boot Lagoon	2.3	1839 Wa-kwa	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine	Replaced by 178.1	12-Jan-18	29-Mar-18	No	Licence issued	
2018	178.1	29-Mar-18	27-Jun-18	691 Boot Lagoon	2.3	1825 Noo-La, Clio Channel	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		12-Jan-18	29-Mar-18		Licence issued	
2018	178.1	29-Mar-18	27-Jun-18	691 Boot Lagoon	2.3	1839 Wa-kwa	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		12-Jan-18	29-Mar-18		Licence issued	
2018	178.1	29-Mar-18	27-Jun-18	691 Boot Lagoon	2.3	869 Maude Island	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		12-Jan-18	29-Mar-18		Licence issued	
2018	179	16-Mar-18	14-Jun-18	180 Ocean Farm Hatchery	2.1	1825 Noo-La, Clio Channel	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine	Replaced by 179.1	16-Jan-18	29-Mar-18	No	Licence issued	
2018	179	16-Mar-18	14-Jun-18	180 Ocean Farm Hatchery	2.1	1839 Wa-kwa	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine	Replaced by 179.1	16-Jan-18	29-Mar-18	No	Licence issued	
2018	179.1	29-Mar-18	27-Jun-18	180 Ocean Farm Hatchery	2.1	1825 Noo-La, Clio Channel	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		16-Jan-18	29-Mar-18	No	Licence issued	
2018	179.1	29-Mar-18	27-Jun-18	180 Ocean Farm Hatchery	2.1	1839 Wa-kwa	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		16-Jan-18	29-Mar-18	No	Licence issued	
2018	179.1	29-Mar-18	27-Jun-18	180 Ocean Farm Hatchery	2.1	869 Maude Island	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		16-Jan-18	29-Mar-18	No	Licence issued	
2018	180	29-Mar-18	27-Jun-18	506 Little Bear Bay	2.2	1825 Noo-La, Clio Channel	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		07-Feb-18	29-Mar-18	No	Licence issued	
2018	180	29-Mar-18	27-Jun-18	506 Little Bear Bay	2.2	1839 Wa-kwa	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		07-Feb-18	29-Mar-18	No	Licence issued	
2018	181	03-Apr-18	02-Jul-18	1350 Shaker Bay	3.4	1351 Mersh Bay, Stuart Road N. of P. Hardy	3.4 Marine Harvest	Atlantic Salmon	Smolts	Marine to marine		10-Oct-17	26-Mar-18	No	Licence issued	
2018	182	29-Mar-18	27-Jun-18	506 Little Bear Bay	2.2	869 Maude Island	3.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		07-Feb-18	29-Mar-18	No	Licence issued	
2018	183	05-Apr-18	04-Jul-18	1689 Ocean Falls	3.5	1691 Kid Bay	3.5 Marine Harvest	Atlantic Salmon	Smolts	Hatchery to marine		22-Feb-18	04-Apr-18	No	Licence issued	
2018	184	18-Apr-18	17-Jul-18	Gold River Hatchery	2.4	1825 Noo-La, Clio Channel	3.3 Greif Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Jan-18	05-Mar-18	No	Licence issued	
2018	184	18-Apr-18	17-Jul-18	Gold River Hatchery	2.4	1839 Wa-kwa	3.3 Greif Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Jan-18	05-Mar-18	No	Licence issued	
2018	185	13-Apr-18	12-Jul-18	1862 Hecate	2.4	1863 Esperanza	2.4 Greif Seafood	Atlantic Salmon	Smolts	Marine to marine		13-Feb-18	10-Apr-18	No	Licence issued	
2018	186	26-Apr-18	26-Jul-18	1079 Steamer Point	2.4	1863 Esperanza	2.4 Greif Seafood	Atlantic Salmon	Smolts	Marine to marine		13-Feb-18	10-Apr-18	Yes	Pre-transfer grading; least affected pens/fish post-transferred; Chronic, historic mouthrot in population	Licence issued
2018	187	26-Apr-18	26-Jul-18	47 Hatchery	2.0	820 Wicklow	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		24-Apr-18	26-Apr-18	Yes	Hatchery biosecurity measures implemented; exposure of fish to be transferred, verified by serial testing	Licence issued
2018	188	20-Apr-18	19-Jul-18	79 Big Tree Creek	2.2	1386 Doctor Islet, Knight Inlet	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		13-Apr-18	13-Apr-18	No		Licence issued
2018	189	05-Aug-18	05-Aug-18	79 Big Tree Creek	2.2	820 Wicklow	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		13-Apr-18	13-Apr-18	No		Licence issued
2018	190	07-May-18	07-May-18	141 Port Elizabeth	3.3	380 Sonora Point	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	Marine to marine		25-Jan-18	02-May-18	Yes	Pre-transfer antibiotic treatment; pre-transfer grading; least affected pens/fish post-transferred; transfer monitoring and reporting; Winer ulcer in population	Licence issued

2018	191	22-May-18	20-Aug-18	892 Bell Island	3.4	78 Phillips Arm, Cardero Channel	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	Marine to marine		30-Jan-18	14-May-18	No	Licence issued
2018	192	23-May-18	21-Aug-18	Sea Spring Hatchery	2.1	233 Indian Bay, Tofo Inlet	2.3 Crevette Salmon Canada	Chinook Salmon	Smolts	Hatchery to marine		11-May-18	14-May-18	No	Licence issued
2018	193	25-May-18	23-Aug-18	Yellow Island Hatchery	3.2	215 Yellow Island Aquaculture	3.2 Yellow Island Aquaculture (1994) Ltd.	Chinook Salmon	Smolts	Hatchery to marine		04-May-18	24-May-18	No	Licence issued
2018	194	05-Jun-18	03-Sep-18	143 Larsen Island	3.3	380 Sonora Island	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	Marine to marine		12-Apr-18	29-May-18	No	Licence issued
2018	195	05-Jun-18	09-Sep-18	143 Larsen Island	3.3	100 Lees Bay	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	Marine to marine		12-Apr-18	29-May-18	No	Licence issued
2018	196	05-Jun-18	03-Sep-18	143 Larsen Island	3.3	790 Chancellor Channel	3.2 Marine Harvest Canada	Atlantic Salmon	Smolts	Marine to marine		12-Apr-18	29-May-18	No	Licence issued
2018	197	03-Jun-18	30-Aug-18	79 Big Tree Hatchery	2.2	1689 Ocean Falls	3.5 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to hatchery		13-Apr-18	31-May-18	No	Licence issued
2018	198	28-Jun-18	26-Sep-18	271 Freshwater Farms	2.1	1689 Ocean Falls	3.5 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to hatchery		23-Jun-18	23-Jun-18	No	Licence issued
2018	199	09-Jul-18	01-Oct-18	1288 Doyle Island	3.4	1382 Robertson Island	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts	Marine to marine		26-Apr-18	28-Jun-18	No	Licence issued
2018	200	11-Jul-18	10-Oct-18	Shelter Passage, Wharft Island	3.4	1382 Robertson Island	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts	Marine to marine		24-Apr-18	28-Jun-18	No	Licence issued
2018	201	22-Jun-18	21-Aug-18	N/A (research Pacific Biological facility) Station (lab)	N/A (research Pacific Biological facility) Station (net pens)	2.1 Fisheries and Oceans Canada	Atlantic Salmon	Smolts	Research lab to marine		n/a	n/a	No	Licence issued	
2018	202	17-Aug-18	15-Nov-18	693 Boat Lagoon	2.3	234 Dixon Point, Shelter Inlet	2.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		07-Aug-18	09-Aug-18	Yes	Licence issued
2018	203	17-Aug-18	15-Nov-18	693 Boat Lagoon	2.3	1507 Millar Channel	2.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		02-Aug-18	03-Aug-18	Yes	Licence issued
2018	204	17-Aug-18	15-Nov-18	693 Boat Lagoon	2.3	314 Ross Pass, Northeast McKay	2.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		02-Aug-18	03-Aug-18	Yes	Licence issued
2018	205	17-Aug-18	15-Nov-18	180 Ocean Farms	2.1	234 Dixon Point, Shelter Inlet	2.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		01-Aug-18	03-Aug-18	Yes	Licence issued
2018	206	17-Aug-18	15-Nov-18	180 Ocean Farms	2.1	234 Dixon Point, Shelter Inlet	2.3 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine		01-Aug-18	03-Aug-18	Yes	Licence issued
2018	207	09-Oct-18	01-Jan-19	1689 Hatchery	3.2	7714 Alexander Inlet	3.5 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		25-Sep-18	26-Sep-18	No	Licence issued
2018	208	10-Oct-18	08-Jan-19	79 Little Bear Bay Hatchery	2.2	146 Koslomo Inlet	2.4 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		21-Sep-18	04-Oct-18	No	Licence issued
2018	209	09-Oct-18	01-Jan-19	506 Little Bear Bay Hatchery	2.2	1849 Muchalat North	2.4 Cermaq	Atlantic Salmon	Smolts	Hatchery to marine	replaced by licence 209.1	25-Sep-18	25-Sep-18	No	Licence issued

2018	209	09-Oct-18	01-Jan-19	506	Little Bear Bay Hatchery	2.2	1705	Williamson Passage	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine	replaced by licence 209.1	25-Sep-18	25-Sep-18	No		Licence issued
2018	209	09-Oct-18	01-Jan-19	506	Little Bear Bay Hatchery	2.2	1789	Conception Pt	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine	replaced by licence 209.1	25-Sep-18	25-Sep-18	No		Licence issued
2018	209	09-Oct-18	01-Jan-19	506	Little Bear Bay Hatchery	2.2	1762	Gore Island	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine	replaced by licence 209.1	25-Sep-18	25-Sep-18	No		Licence issued
2018	209.1	05-Oct-18	03-Jan-19	506	Little Bear Bay Hatchery	2.2	1849	Muchalat North	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine	replaced by licence 209.2	25-Sep-18	25-Sep-18	No		Licence issued
2018	209.1	05-Oct-18	03-Jan-19	506	Little Bear Bay Hatchery	2.2	1705	Williamson Passage	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine	replaced by licence 209.2	25-Sep-18	25-Sep-18	No		Licence issued
2018	209.1	05-Oct-18	03-Jan-19	506	Little Bear Bay Hatchery	2.2	1789	Conception Pt	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine	replaced by licence 209.2	25-Sep-18	25-Sep-18	No		Licence issued
2018	209.1	05-Oct-18	03-Jan-19	506	Little Bear Bay Hatchery	2.2	1762	Gore Island	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine	replaced by licence 209.2	25-Sep-18	25-Sep-18	No		Licence issued
2018	209.2	05-Oct-18	03-Jan-19	506	Bear Bay Hatchery	2.2	1849	Muchalat North	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine		25-Sep-18	25-Sep-18	No		Licence issued
2018	209.2	05-Oct-18	03-Jan-19	506	Bear Bay Hatchery	2.2	1705	Williamson Passage	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine		25-Sep-18	25-Sep-18	No		Licence issued
2018	209.2	05-Oct-18	03-Jan-19	506	Bear Bay Hatchery	2.2	1789	Conception Pt	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine		25-Sep-18	25-Sep-18	No		Licence issued
2018	209.2	05-Oct-18	03-Jan-19	506	Bear Bay Hatchery	2.2	1762	Gore Island	2.4 Cernaq		Atlantic Salmon	Smolts	Hatchery to marine		25-Sep-18	25-Sep-18	No		Licence issued
2018	210	17-Oct-18	15-Jan-19	1288	Doyle Island	3.4	1293	Duncan Island	3.4 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to marine	replaced by licence 210.1	10-Oct-18	16-Oct-18	No		Licence issued
2018	210.1	17-Oct-18	15-Jan-19	1288	Doyle Island	3.4	1293	Duncan Island	3.4 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to marine		10-Oct-18	16-Oct-18	No		Licence issued
2018	211	18-Oct-18	16-Jan-19	831	Shelter Passage, Wishart Island	3.4	1293	Duncan Island	3.4 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to marine		10-Oct-18	12-Oct-18	No		Licence issued
2018	212	22-Oct-18	20-Jan-19	831	Shelter Passage, Wishart Island	3.4	1136	Shaw Point	3.3 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to marine		10-Oct-18	12-Oct-18	No		Licence issued
2018	213	17-Oct-18	15-Jan-18	1586	Doctor Isles	3.3	1300	Althorpe	3.3 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to marine		11-Oct-18	17-Oct-18	Yes	Atypical furunculosis	Licence issued
2018	214	17-Oct-18	15-Jan-19	47	Dalrymple Hatchery	2.2	1237	Monday Rocks	2.4 Marine Harvest Canada		Atlantic Salmon	Smolts	Hatchery to marine		5-Oct-18	12-Oct-18	No		Licence issued
2018	215	17-Oct-18	15-Jan-19	47	Dalrymple Hatchery	2.2	144	Koskimo	2.4 Marine Harvest Canada		Atlantic Salmon	Smolts	Hatchery to marine		5-Oct-18	12-Oct-18	No		Licence issued
2018	216	2-Nov-18	31-Jan-19	831	Shelter Pass	3.4	1581	Hardwicke	3.3 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to Marine		10-Oct-18	12-Oct-18	No		Licence issued
2018	217	2-Nov-18	31-Jan-19	465	Swanson Island	3.3	1300	Althorpe	3.3 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to marine		11-Oct-18	23-Oct-18	No		Licence issued
2018	218	2-Nov-18	31-Jan-19	465	Swanson Island	3.3	1581	Hardwicke	3.3 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to marine		11-Oct-18	23-Oct-18	No		Licence issued
2018	219	2-Nov-18	31-Jan-19	820	Wicklow Point	3.3	1581	Hardwicke	3.3 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to marine		25-Jul-18	26-Oct-18	No		Licence issued
2018	220	2-Nov-18	31-Jan-19	1689	Ocean Falls	3.5	1238	Mahatta West	2.4 Marine Harvest Canada		Atlantic Salmon	Smolts	Hatchery to marine		26-Sep-18	19-Oct-18	No		Licence issued
2018	221	2-Nov-18	31-Jan-19	79	Big Tree Creek	2.2	1238	Mahatta West	2.4 Marine Harvest Canada		Atlantic Salmon	Smolts	Hatchery to marine		27-Sep-18	19-Oct-18	No		Licence issued
2018	222	8-Nov-18	6-Feb-19	1825	No-Is	3.3	7773	Tas-Ya	3.3 Greig Seafood		Atlantic Salmon	Smolts	Marine to marine		17-Oct-18	26-Oct-18	No		Licence issued
2018	223	20-Nov-18	19-Feb-19	831	Shelter Pass	3.4	1300	Althorpe	3.3 Marine Harvest Canada		Atlantic Salmon	Smolts	Marine to marine		10-Oct-18	15-Nov-18	Yes	pre-transfer hydrogen peroxide	Licence issued
2018	224	26-Nov-18	24-Feb-19	387	Lens Creek	3.1	1705	Williamson Passage	2.4 Greig Seafood		Atlantic Salmon	Smolts	Hatchery to marine		16-Aug-18	16-Nov-18	No		Licence issued
2018	224	26-Nov-18	24-Feb-19	387	Lens Creek	3.1	1849	Muchalat North	2.4 Greig Seafood		Atlantic Salmon	Smolts	Hatchery to marine		16-Aug-18	16-Nov-18	No		Licence issued
2018	224	26-Nov-18	24-Feb-19	387	Lens Creek	3.1	1789	Conception Pt	2.4 Greig Seafood		Atlantic Salmon	Smolts	Hatchery to marine		16-Aug-18	16-Nov-18	No		Licence issued
2018	224	26-Nov-18	24-Feb-18	387	Lens Creek	3.1	1762	Gore Island	2.4 Greig Seafood		Atlantic Salmon	Smolts	Hatchery to marine		16-Aug-18	16-Nov-18	No		Licence issued
2018	225	26-Nov-18	24-Feb-19	1680	Gold River hatchery	2.4	1705	Williamson Passage	2.4 Greig Seafood		Atlantic Salmon	Smolts	Hatchery to marine		15-Nov-18	16-Nov-18	No		Licence issued

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2018	225	26-Nov-18	24-Feb-19	1680	Gold River hatchery	2.4	1849	Muchlat North	2.4	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Nov-18	16-Nov-18	Licence issued
2018	225	26-Nov-18	24-Feb-19	1680	Gold River hatchery	2.4	1789	Concepcion Pt	2.4	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Nov-18	16-Nov-18	Licence issued
2018	225	26-Nov-18	24-Feb-19	1680	Gold River hatchery	2.4	1762	Gore Island	2.4	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Nov-18	16-Nov-18	Licence issued
2018	226	28-Nov-18	26-Feb-18	47	Dalrymple Hatchery	2.2	1238	Mahatta West	2.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		5-Oct-18	27-Nov-18	Licence issued
2018	227	28-Nov-18	26-Feb-18	47	Dalrymple Hatchery	2.2	892	Ball Island	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		5-Oct-18	27-Nov-18	Licence issued
2018	228	10-Dec-18	10-Mar-19	79	Big Tree Creek	2.2	892	Ball Island	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		27-Sep-18	4-Dec-18	Licence issued
2018	229	12-Dec-18	12-Mar-19	1136	Shaw Point	3.3	303	Glacial Creek	3.1	Marine Harvest Canada	Atlantic Salmon	Adults	Marine to marine		n/a	30-Nov-18	Licence issued
2018	231	11-Dec-18	11-Mar-19	691	Boot Lagoon	2.3	1789	Concepcion Pt	2.4	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		20-Nov-18	20-Nov-18	Licence issued
2018	232	13-Dec-18	13-Mar-19	180	Ocean Farms	2.1	1789	Concepcion Pt	2.4	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		09-Dec-18	7-Dec-18	Licence issued
2018	232	13-Dec-18	13-Mar-19	180	Ocean Farms	2.1	1697	Colluden Point	3.1	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		09-Dec-18	7-Dec-18	Licence issued
2018	233	24-Dec-18	24-Mar-19	47	Dalrymple Hatchery	2.2	1059	Sargeant Pass	3.3	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		12-Dec-18	19-Dec-18	Licence issued
2018	234	20-Dec-18	20-Mar-19	1689	Ocean Falls Hatchery	3.5	1059	Sargeant Pass	3.3	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		26-Sep-18	17-Dec-18	Licence issued
2018	235	27-Dec-18	27-Mar-19	79	Big Tree Creek	2.2	1059	Sargeant Pass	3.3	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		11-Dec-18	17-Dec-18	Licence issued
2018	236	27-Dec-18	27-Mar-19	79	Big Tree Creek	2.2	1198	Raynor	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		11-Dec-18	17-Dec-18	Licence issued
2019	238	31-Jan-19	01-May-19	691	Boot Lagoon	2.3	543	Mussel Rock	2.3	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		30-Nov-18	10-Jan-19	Licence issued
2019	238	31-Jan-19	01-May-19	691	Boot Lagoon	2.3	1396	Simmonds Bay	3.4	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		30-Nov-18	10-Jan-19	Licence issued
2019	238	31-Jan-19	01-May-19	691	Boot Lagoon	2.3	527	Sarniac Island	2.3	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		30-Nov-18	10-Jan-19	Licence issued
2019	239	04-Feb-19	05-May-19	506	Little Bear Hatchery	2.2	819	Cecil Island	3.3	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		11-Jan-19	31-Jan-19	Licence issued
2019	239	04-Feb-19	05-May-19	506	Little Bear Hatchery	2.2	1386	Simmonds Bay	3.4	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		11-Jan-19	31-Jan-19	Licence issued
2019	240	31-Jan-19	01-May-19	180	Ocean Farm Hatchery	2.3	458	Cypress Harbour	3.3	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		09-Dec-18	11-Jan-19	Licence issued
2019	240	31-Jan-19	01-May-19	180	Ocean Farm Hatchery	2.3	543	Mussel Rock	2.3	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		09-Dec-18	11-Jan-19	Licence issued
2019	240	31-Jan-19	01-May-19	180	Ocean Farm Hatchery	2.3	527	Sarniac Island	2.3	Cermaq Canada Ltd.	Atlantic Salmon	Smolts	Hatchery to marine		09-Dec-18	11-Jan-19	Licence issued
2019	241	20-Jan-19	20-Apr-19	1680	Gold River hatchery	2.4	1688	Aldersom Point	3.1	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Nov-18	10-Jan-19	Licence issued
2019	241	20-Jan-19	20-Apr-19	1680	Gold River hatchery	2.4	332	Saltier	3.1	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Nov-18	10-Jan-19	Licence issued
2019	241	20-Jan-19	20-Apr-19	1680	Gold River hatchery	2.4	221	Vantage Point	3.1	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Nov-18	10-Jan-19	Licence issued
2019	241	20-Jan-19	20-Apr-19	1680	Gold River hatchery	2.4	746	Site 13	3.1	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Nov-18	10-Jan-19	Licence issued
2019	241	20-Jan-19	20-Apr-19	1680	Gold River hatchery	2.4	1697	Colluden Point	3.1	Grieg Seafood	Atlantic Salmon	Smolts	Hatchery to marine		15-Nov-18	10-Jan-19	Licence issued
2019	242	23-Jan-19	23-Apr-19	47	Dalrymple Hatchery	2.2	7053	Ghiya Bull Harbour	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		11-Dec-18	21-Jan-19	Licence issued
2019	243	14-Feb-19	12-May-19	271	Freshwater Farms	2.1	1136	Shaw Point	3.3	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		01-Feb-19	08-Feb-19	Licence issued
2019	244	15-Feb-19	16-May-19	79	Big Tree Creek	2.2	1059	Sargeant Passage	3.3	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		11-Dec-18	13-Feb-19	Licence issued
2019	245	15-Feb-19	02-May-19	79	Big Tree Creek	2.2	7053	Ghiya Bull Harbour	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		11-Dec-18	13-Feb-19	Licence issued
2019	246	15-Feb-19	02-May-19	79	Big Tree Creek	2.2	1198	Raynor	3.4	Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		11-Dec-18	13-Feb-19	Licence issued
2019	248	21-Feb-19	22-May-19	1596	Dawley Passage	2.3	1899	Warne Island	2.3	Creative Salmon	Chinook Salmon	Adult (brood)	Marine to marine		22-Nov-18	12-Feb-19	Licence issued
2019	249	07-Mar-19	05-Jun-19	314	Ross Pass	2.3	1148	Blinn Island, Herbert Inlet	2.3	Cermaq Canada Ltd.	Atlantic Salmon	Adult (brood)	Marine to marine		26-Feb-19	05-Mar-19	Licence issued
2019	249	07-Mar-19	05-Jun-19	314	Ross Pass	2.3	227	Bawden Point	2.3	Cermaq Canada Ltd.	Atlantic Salmon	Adult (brood)	Marine to marine		26-Feb-19	05-Mar-19	Licence issued
2019	250	07-Mar-19	02-May-19	234	Dixon Point	2.3	1148	Blinn Island, Herbert Inlet	2.3	Cermaq Canada Ltd.	Atlantic Salmon	Adult (brood)	Marine to marine		20-Nov-18	05-Mar-19	Licence issued
														Pre-transfer antibiotic treatment; harvest at source facility; post-transfer monitoring and reporting post-transfer antibiotic treatment (SRS, Anemia)			

2019	250	07-Mar-19	02-May-19	234	Dixon Point	2.3	227	Bawden Point	2.1 Cermaq Canada Ltd.	Atlantic Salmon	Adult	Marine to marine		20-Nov-18	05-Mar-19	No	Licence Issued
2019	251	01-Mar-08	06-Jun-19	79	Big Tree Creek Hatchery	2.2	143	Larsen Island	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		22-Feb-19	25-Feb-19	No	Licence Issued
2019	252	27-Feb-19	28-May-19	79	Big Tree Creek Hatchery	2.2	1198	Raynor	3.4 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		22-Feb-19	25-Feb-19	No	Licence Issued
2019	253	13-Mar-19	09-Jun-19	1689	Ocean Falls Hatchery	3.5	143	Larsen Island	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		28-Feb-19	01-Mar-08	No	Licence Issued
2019	254	13-Mar-19	09-Jun-19	1689	Ocean Falls Hatchery	3.5	7713	Cougar Bay	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		28-Feb-19	01-Mar-08	No	Licence Issued
2019	255	13-Mar-19	11-Jun-19	691	Boat Lagoon Hatchery	2.3	1697	Culloden Point	3.1 Grief Seafood	Atlantic Salmon	Smolts	Hatchery to marine		04-Mar-19	06-Mar-19	No	Licence Issued
2019	256	13-Mar-19	11-Jun-19	180	Ocean Falls Hatchery	2.3	1697	Culloden Point	3.1 Grief Seafood	Atlantic Salmon	Smolts	Hatchery to marine		01-Mar-19	06-Mar-19	No	Licence Issued
2019	261	29-Mar-19	27-Jun-19	1689	Dalrymple Hatchery	3.5	467	Midsunmer Island	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		28-Feb-19	15-Mar-19	No	Licence Issued
2019	262	1-Apr-19	30-Jun-19	47	Dalrymple Hatchery	2.2	143	Larsen Island	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		4-Mar-19	15-Mar-19	No	Licence Issued
2019	263	1-Apr-19	30-Jun-19	47	Dalrymple Hatchery	2.2	1618	Humphrey Rock	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		4-Mar-19	15-Mar-19	No	Licence Issued
2019	265	1-Apr-19	30-Jun-19	1689	Ocean Falls Hatchery	3.5	1618	Humphrey Rock	3.3 Marine Harvest Canada	Atlantic Salmon	Smolts	Hatchery to marine		28-Feb-19	15-Mar-19	No	Licence Issued

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